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PERSONAL COMPUTING

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A New Generation Of Easy Computing

Rx For Computerphobia

Computer Camps For Kids

Safeguarding Your Hardware And Software

How A Payroll Package Saved A Business

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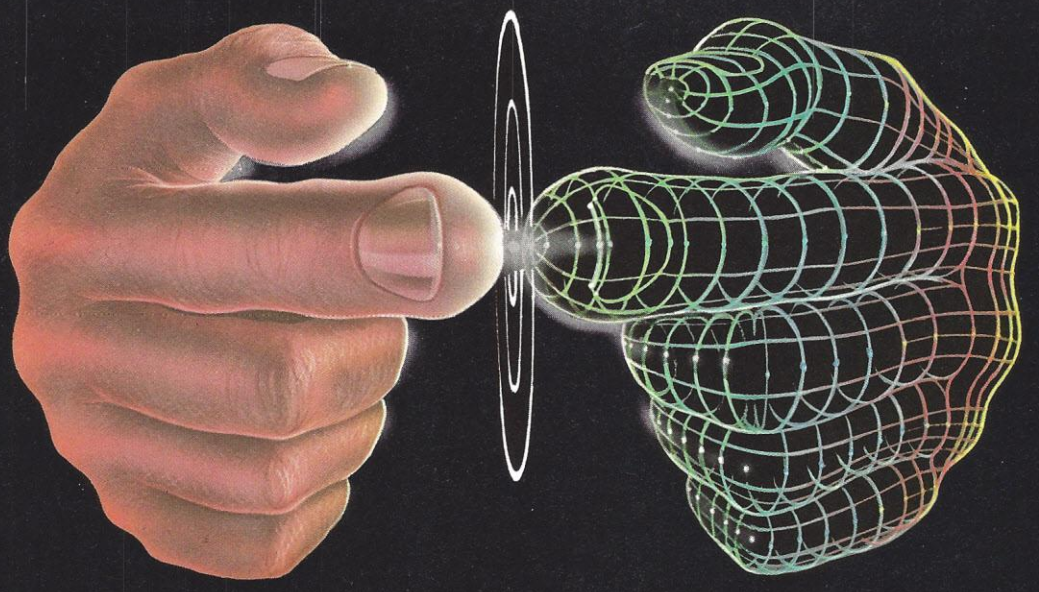

Productivity at your fingertips.

The NEC PC-8000 Series is the best-selling microcomputer system in Japan, a country where productivity is something of a national pastime.

Now American ingenuity has provided it — and you — with an especially powerful version of Microsoft® BASIC, CP/M®, with its legendary treasure-house of languages and software, as well as a rapidly expanding family of our own application software packages, available right now.

These include general accounting, accounts receivable, inventory control, data base management, word processing, with dozens more on the way.

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People are calling it the "end of the compromise" in microcomputers.

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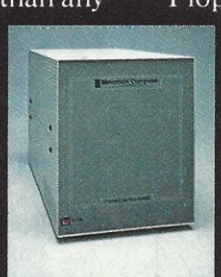

If you need the size, speed and reliability of a hard disk, Mountain has the disk for you. Floppies just don't have the capacity for those big computing jobs. And other hard disks don't have the usable storage space of Mountain's.

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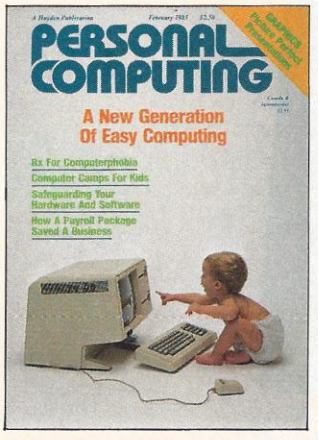
CIRCLE 2

February 1983
Volume 7
Number 2
A Hayden Publication

PERSONAL COMPUTING

FEATURES



A new computing era has been born—one that could be called the age of the "easy computer." The birth was long and laborious, but this new generation of personal computers promises to make the problems of the past relics of a day gone by. Page 48

COVER PHOTOGRAPHY
GEORGE B. FRY III

ESSAY
A New Generation Arrives *48*
Recent computer advances indicate that an era of easy computing—where more efficiency is achieved with little cost in time and effort—is finally upon us.

BUSINESS
A System That Pays For Itself *54*
Computerizing a business' payroll can mean more than just turning a paper-laden manual system into a bookkeeper's dream—it also allows employers to carefully monitor salary levels and negotiate raises with more facts at their fingertips.

PROFESSIONAL/MANAGERIAL
Striking Back At Technological Terror *62*
Understanding the personal computer can, at first, be an intimidating prospect—and computerphobia often hits many managers just when they realize they need the machine to survive in business. An antidote—the hands-on training session—has become the most common treatment for this condition.

PROFESSIONAL/MANAGERIAL
Catching Up With Continental Drift *68*
Geophysicists looking into the history of earth in order to plot the future were moving forward slowly until they hooked a personal computer into their data. Now they are able to do in months what previously took a lifetime of work.

BUSINESS
Can You Take A Catastrophe? *78*
Can your small business, relying on a personal computer, survive fire, earthquake, or flood? Yes it can—if you make careful disaster plans now.

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The new generation of easier computing: It helps overcome the barrier between man and his ability to leverage his thinking power

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STATE OF THE ART

The Birth Of LISA *88*

The LISA project—even the mention of its existence—sent rumors throughout the computing industry. But where and how did it all begin? Who were the men behind the machine?

SPECIAL REPORT

Computer Graphics: The Perfect Visual Message *96*

Creating the graphic that helps sell your product or idea with the most impact is a task best delegated to a personal computer. We'll tell you what you need to know to get started.

ADVANCED

Logically Designed Logic Software *115*

New software is allowing engineers to use personal computers for the design of logic networks. Not only that, this same software allows simulation runs that have other—diverse—applications.

EDUCATION

Computer Camp—An Educational Alternative *126*

Imagine children trundling off to summer camp to spend time learning about computers. Sounds like summer school instead of summer camp. Well, there's always time for everything—from boating to BASIC.

STATE OF THE ART

Reading A Package By Its Cover *134*

Software documentation often leaves something to be desired, according to some who have tried everything but a language course in Swahili to understand it.

181 **Hardware of the Month**
Apple's easy-to-use office personal computer, LISA; a new personal computer from Corona

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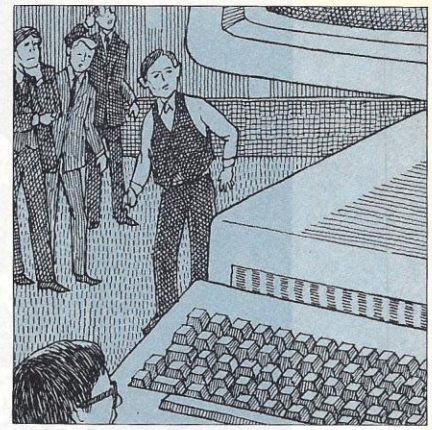

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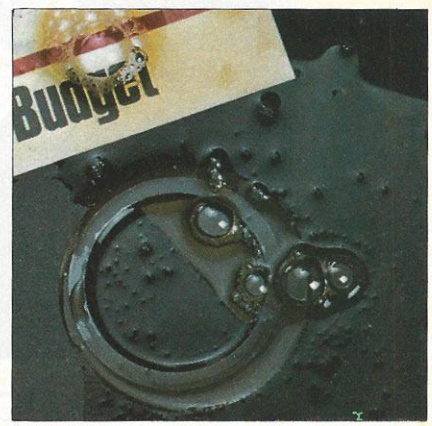

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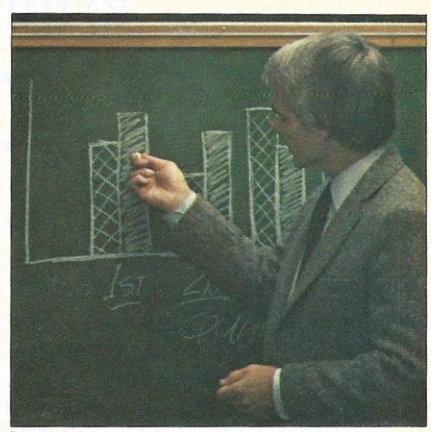

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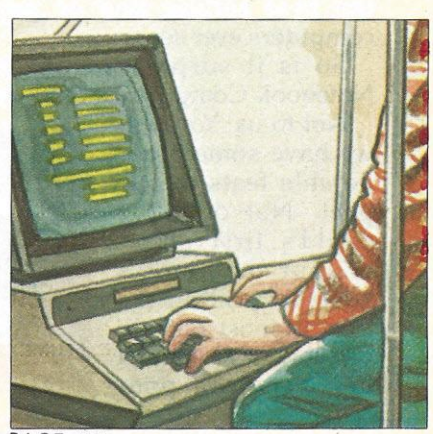

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One company has sold more printers to this planet than anybody.

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By now, that shouldn't come as a surprise. After all, we *invented* digital printers for the 1964 Tokyo Olympics. We've built more print mechanisms than the rest of the manufacturers in the world combined. And our MX Series is the best selling line of printers for small computers ever seen.

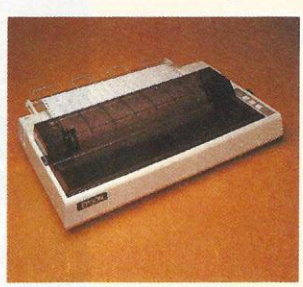
So is it surprising that the world's first Notebook Computer should come from Epson?

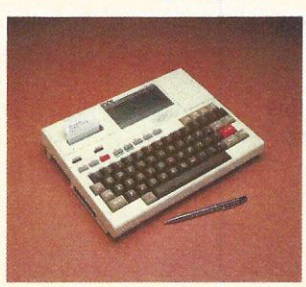
Not to us. You see, we have some other notable feats in our past. Not only the world's first printer, but the world's smallest printer, the world's most reliable printers, the world's first disposable print head, and now, the world's first portable computer with the power of a desktop.

We intend to be as big in personal computers as we are in printers. And we'll do it the same way. By making computers you can count on to perform. With the options, software and interfaces you need. And by delivering what we promise, at prices people can afford.

But some people don't think we can do in computers what we've already done in printers. And for them, we have this advice:

Just watch.





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CIRCLE 64

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Onward With Easier Computing

Not much in this world stands still, and that's especially true as regards the exploding technology associated with personal computing.

The personal computer on our cover, Apple's new LISA, ushers in a new age, a new generation of personal computers for serious business use—and moves us toward a future in which computing will be easier than driving an automobile. We say easier because driving an automobile today isn't all that easy. The point is, you don't have to know much about how an automobile works in order to use it. And in the new generation of personal computing, you won't have to know very much about how computing works in order to compute.

LISA, which is described more fully in our Hardware of the Month section beginning on page 181, isn't the only new-generational representative in this issue of *Personal Computing*. Indeed, new ideas are bursting out all over. Leading off our Software of the Month section on page 217 are sophisticated and easy-to-use new products from VisiCorp and from Hayes Microcomputer Products.

VisiCorp's VisiOn enables a user to visually manipulate images of graphs and charts in the same way that one would manipulate papers on a desk. Hayes' Smartcom offers a shortcut to connecting with a data base—and to the particular element of the data base you want to access.

All of these help to subdue the barrier between man and the leveraged thinking power that personal computing offers to individuals.

That's an important barrier to subdue. The value of a tool, after all, is in its effectiveness as a multiplier of effort. If you couldn't drive a nail better with a hammer than with your fist, why use a hammer?

The advantages of a physical tool are obvious and easily measured. The advantages of a mental tool are less obvious and more difficult to measure. We simply haven't had powerful, personal thinking tools available long enough to understand how much they can do. Perceived barriers, therefore, loom larger in the mind than the barriers really are.

The bottom line in the decision to use a personal computer is a "yes" answer to the question, "Does the benefit outweigh the cost?" The new age of easier use, we predict, will quickly tip the scales for many people now wary of computing, toward the benefit side of the equation. And easier-to-use computing products, we predict, will spawn more and more hardware and software that is still easier to use.

Speaking of ease of use, you may have noticed a difference this month in the way the pages of *Personal Computing* are fastened together—with a hard spine and glue instead of with wire staples. In the magazine industry it's called "perfect binding" and the staple method is called "saddle stitch." What's the ease-of-use angle? We think you'll find the cover of your issue less likely to come off—an irritant many readers have told us about. Saddle stitching has its advantages (the pages lay flat more readily, for one), but as our number of pages increased we simply outgrew the former manufacturing method.

In the works for next month are several more changes in the magazine—improvements in content and organization of our pages that we think you will like.

Paul Kellam

Not all business And we've got the

As you know, one picture is worth a few thousand numbers.

As you may not know, Apple® Business Graphics software can generate more types of pictures, in more colors, using more data than any other graphics package.

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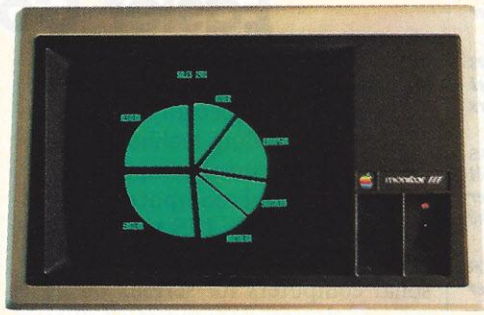
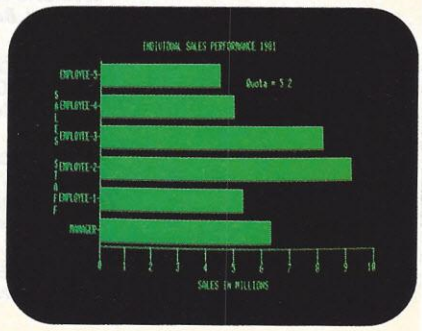
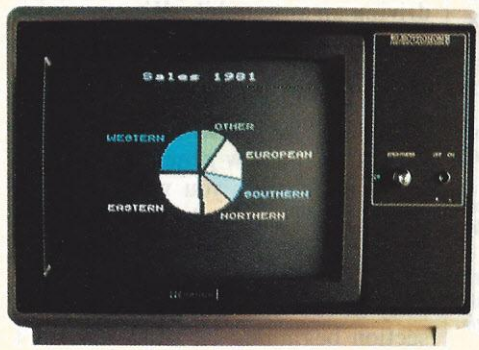
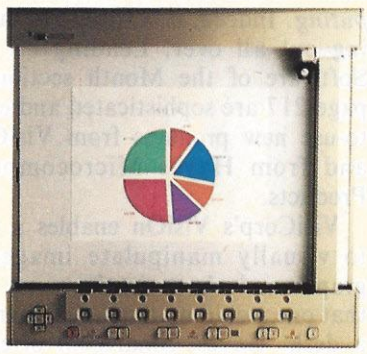


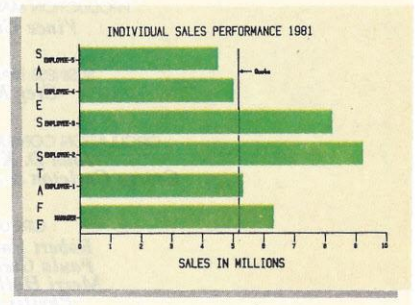


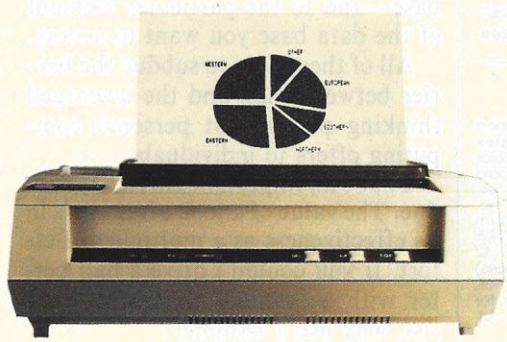


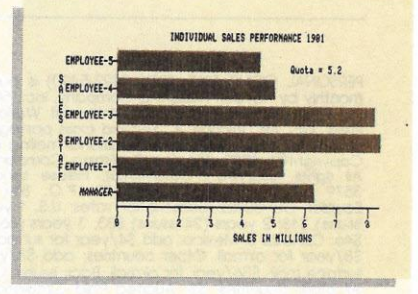
	Apple	VisiTrend/ VisiPlot	pfsGraph
Graph Types			
Line	Yes	Yes	Yes
Vertical Bar	Yes	Yes	Yes
Horizontal Bar	Yes	No	No
Side-by-side Bar	Up to 4	2	4
Pie	Yes	Yes	Yes
Partial Pie	Yes	No	No
Scattergram	Yes	Yes	No
Curve Fitting	5 Kinds	1	None
Data Points (Max.)	3500+	645	36
Plotter Compatible	Virtually Any	None	H-P7470A Only
Compatible File Types	Pascal BASIC VisiCalc	BASIC VisiCalc	pfs VisiCalc
Math Functions	Yes	Yes	No
Available Colors	6	4	4

Apple Business Graphics is available for both the Apple II and Apple III.









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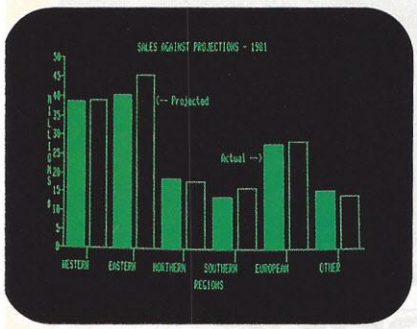

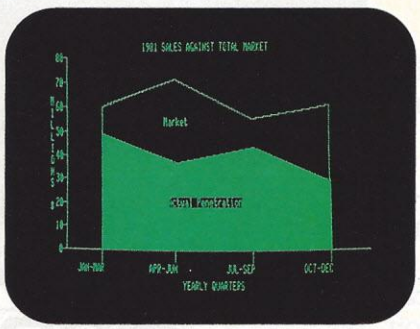

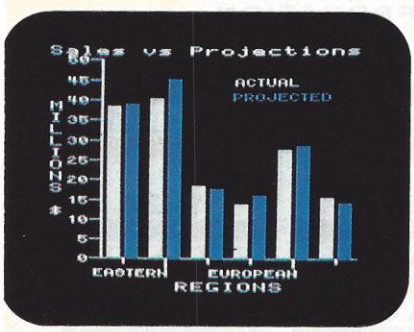

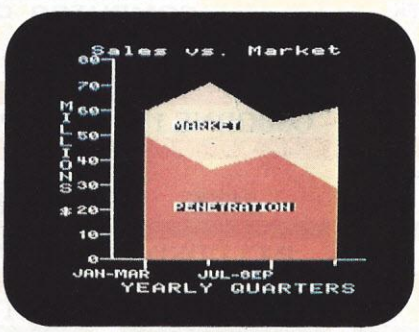

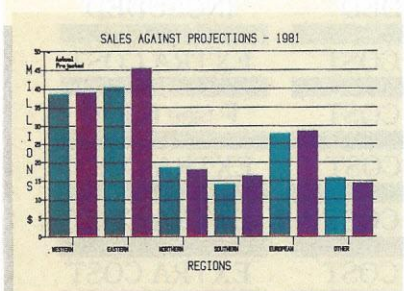

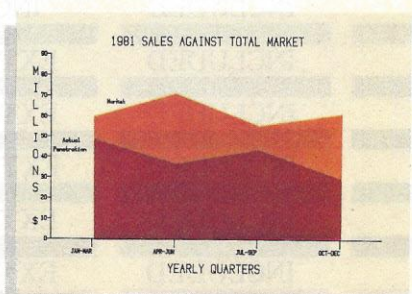

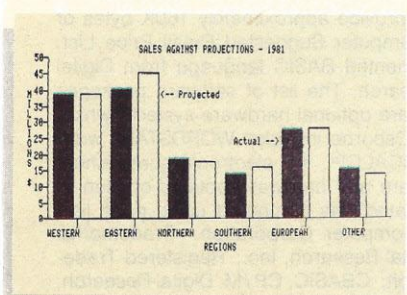

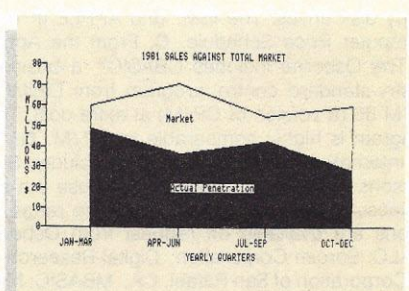

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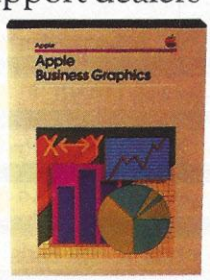

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Business BASIC[E]:	INCLUDED	EXTRA COST	EXTRA COST
CP/M® Control Program:	INCLUDED	EXTRA COST	F (see below)
Word Processing[G]:	INCLUDED	EXTRA COST	EXTRA COST
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TOTAL PRICE[I]:	**$1795**	**$4000–4700**	**$4000–4700**

A. The Osborne 1™ includes two built-in 100K byte floppy disk drives. The IBM® and APPLE II® drives provide approximately 160K bytes of storage. **B.** From the IBM Product Center Personal Computer Price Schedule. **C.** From the Apple Computer Suggested Retail Price List. **D.** The Osborne includes MBASIC® from Microsoft. **E.** The Osborne includes CBASIC®, a business-oriented BASIC language from Digital Research.™ **F.** The Osborne includes CP/M®, the industry-standard control program from Digital Research. The list of software packages which will run with CP/M is considerable. IBM offers CP/M 86 (a version of CP/M) at extra cost. There are optional hardware systems which allow the Apple II to run CP/M; the Apple II control program is highly comparable to CP/M. **G.** The Osborne includes WORDSTAR® word processing with MAILMERGE®—products of MicroPro™ International. **H.** The Osborne includes SUPERCALC™, the electronic spreadsheet system from Sorcim Corporation. **I.** Exact price comparisons cannot be presented, because the software and hardware options chosen to create the "equivalent" of the Osborne 1 Personal Business Computer vary in price. The range indicated was computed using price lists from IBM and Apple. Documentation of the computations are available on request from Osborne Computer Corporation. Trademarks: OSBORNE 1: Osborne Computer Corporation; SUPERCALC: Sorcim Corporation; Digital Research: Digital Research, Inc.; Registered Trademarks: WORDSTAR, MAILMERGE: MicroPro International Corporation of San Rafael, CA; MBASIC: Microsoft; CBASIC, CP/M: Digital Research, Inc.; IBM: IBM Corporation; Apple, Apple II: Apple Computer Corporation.

CIRCLE 4

Comments On The Cognitive Revolution

Your December editorial "What to Compute? That is the Question" (page 5) is wonderful—a paltry adjective for a succinct and eloquent discussion of some crucial issues. It contained no equivocation, no excuses—especially regarding skills and unemployment: attitudes toward, and degree of willingness to join. The Cognitive Revolution: and, at the very heart of it all, our own recognition and appreciation of the human mind.

In comparison, muscles are but minor devices—a nice turn of phrase—and something I live and breathe to my children. If only public schools would do the same—and at the elementary level to boot. Thinking skills and languages should be started early.

Hooray for your will, courage, desire, and mostly your thoughts well expressed.

Margaret McCreary
CHESTER SPRINGS, PA

Congratulations on your December 1982 editorial "What to Compute? That is the Question," (page 5). The personal-computer microprocessor is the nautilus equipment for the mind. As physical fitness has emerged, so will mental fitness.

There is only one power that determines the course of every individual life: the power of man's rational faculty—the power of ideas. The microprocessor is an idea whose time has come!

Michael B. Hepecus
TULSA, OK

Thank you for your December issue of *Personal Computing*. It was filled with many interesting articles and informative reports. Keep up the great work. I would like, however, to pass along my reactions to two particular parts of that issue.

Your remarks concerning The Cognitive Revolution and the Soviet Union ("What to Compute? That is the Question," page 5) deserve expansion into a major address. What an uplifting topic! Not enough of us have considered what might happen when the personal computer wave hits the Soviet bloc countries. Your words bring home the fact that the freedom we enjoy here must not be taken for granted. Thank you for reawakening us.

I must now chide you gently, but firmly, for having produced a feature article about computing kids ("Gee Whiz, These Computing Kids," page 58), which contained only a passing—and very incomplete—reference to the LOGO language. Children across the U.S. and around the world are doing incredible things with this powerful, easy-to-learn language. Yet, this was ignored in the article.

The National LOGO Exchange, a newsletter for LOGO teachers, is dedicated to facilitating the exchange of successful LOGO teaching tips, techniques, and strategies among teachers using LOGO in their classrooms. As the editor, I encourage you to do justice to the power and potential of this incredible new educational tool.

Your reference to LOGO on page 64 stated that it was a "versatile graphics language from Texas Instruments." In fact, the language is LISP-like (LISt Processor), with graphics comprising only a small, but highly visible part of its capability. It was not developed by Texas Instruments. Instead, it emerged as the result of more than a decade of painstaking research by Seymour Papert and the LOGO Group of the Massachusetts Institute of Technology Artificial Intelligence Laboratory. However, TI did serve in an important capacity with the field testing of the final product at The Lamplighter School in Dallas.

To date, LOGO is the only computer language that has been developed with educational objectives in mind from the beginning. According to some respected educators, it has the potential to revolutionize education as we now know it. As such, LOGO deserves more than just a passing reference.

You went on to say that simpler versions of LOGO for "younger children" are available from several other firms. This is contrary to my experience. LOGO is available from four sources: One is TI, as you stated, for its TI 99/4A; the others are Apple Computer Co. (written by LOGO Computer Systems Inc.); Terrapin Inc.; and Krell Software for the

"Hayden's *Personal Computing* magazine's accuracy policy: to make diligent efforts to insure the accuracy of editorial material. To publish prompt corrections whenever inaccuracies are brought to our attention. Corrections appear in 'Letters.' To encourage our readers as responsible members of our business community to report to us misleading or fraudulent advertising. To refuse any advertisement deemed to be misleading or fraudulent."

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CIRCLE 5

Apple II. A version for the Commodore 64 may be released soon.

The TI version is by far the simplest. For example, it is limited to integer arithmetic operations, and has a finite limit to its graphics capability. However, it is superbly suited for younger children. If other simpler versions are available, please furnish me with information about them so I can share with our subscribers.

Thank you for the opportunity to share my reactions with your readers. Best wishes for continued success.

Tom Louch
EDITOR
THE NATIONAL LOGO EXCHANGE
CHARLOTTESVILLE, VA

TOUTING THE ATARI 400

In your November 1982 Letters column (page 170), Richard L. Fleagle pointed out the omission of the Atari as a home/office computer choice. I heartily support his position. However, he does make one misleading statement about the Atari 400. The machine will run VisiCalc if sufficient memory is installed.

I have a 400 with an Intec 48k memory board, interface, and disk. VisiCalc works fine, and I have 21k of memory available to the program with the BASIC cartridge removed. Unfortunately, many people are unaware that the machine can be expanded to 48k without using Atari components (thus, it should be installed after the Atari warranty is up).

Electronically, the 400 is similar to the 800. The 400's major incompatibilities with the 800 are its lack of a right cartridge slot, as yet no access to the memory bus, and no color monitor output. And, of course, there is a different style keyboard.

From a software standpoint, the 400 and 800 are the same—the same ROM resident operating system and the same BASIC. One version of DOS runs on both systems. Unless you have programs that require special hardware attached to the 800—the 80-column board, for example—the same programs can run on both the 400 and the 800.

It is unfortunate for those people who purchased Atari computers several years ago that Atari deliberately chose to ignore the business applications for its computer. The computer was, from a hardware standpoint, an excellent business and home system. That is why many of us bought it. Luckily, independent software developers have filled the business-software void.

Robert C. Flint
FAIRFAX, VA

HIGH-TECH SCHOOLING FOR OUR COMPUTING KIDS

I found your December article "The Lowdown on a Computing School" (page 101) informative and interesting, especially because of my background as a former teacher. The Ackermans are, indeed, entrepreneurs.

Youngsters today have a truly special opportunity—to learn "high-tech" and, at the same time, have it a regular part of their daily lives in the form of video games, computerized banking, and more. Schools like Entech serve our children well in preparing them for future jobs, as well as for being productive members of our high-tech society.

Thank you for making me aware that such schools exist. Good luck to the Ackermans.

Dana Rosner
BLOOMINGTON, IN

BUT IS IT COMFORTABLE?

I found your November article "Making Your Workstation Work" (page 72) objective, informative, and disappointing. It was disappointing to me because our company manufactures a computer station and you, we suspect, were not aware of its existence.

Although it was designed for the Apple II, the station is functional with most low profile (separate CRT) units. I am sitting at the "Basic Comfort II" as I hunt and peck to complete this dissertation. My chair leaves room for improvement, but all the height requirements are being met.

Morris Ellis
PRESIDENT
PICTURE HOUSE
DAYTONA BEACH, FL

AN EXAMPLE PLEASE?

We have a question about the tax treatment of software as discussed in the Outlook section ("Software Now Subject To Favorable Tax Treatment" page 18) of your September 1982 issue. Our tax library (we have the CCH, RIA, and Rabkin-Johnson tax services) is in agreement with the first two alternatives presented, as is the Internal Revenue Service Revenue Procedure 69-21. We cannot, however, find any reference to the treatment of "off the shelf" software as tangible personal property qualifying for the investment tax credit.

Our question is simple. Does David Oifer have any court or tax cases that have moved the IRS off their stand that software is an intangible similar to research and development costs? We need to know because purchasers of software will have to justify any stand taken, in regard to tax law that varies from the IRS standards.

Michael N. Tompkins, CPA
WADE, STABLES, SCHANBACHER & WALKER
CERTIFIED PUBLIC ACCOUNTANTS
HANNIBAL, MO

For the answer to your question we went directly to the source—we called David Oifer of the accounting firm Coopers & Lybrand. He said that the IRS has not changed its stand that software is an intangible cost. However, according to Oifer, there have been court decisions regarding some firms that maintained that the costs incurred by any company involved in software research, which resulted in tapes or personal property, could be eligible for investment tax credit—The Editors.

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CIRCLE 6

Will There Be Software For The Commodore 64?

In this monthly column, "Answers," we will respond to your most frequently asked general questions about personal computing. Please send your questions to: Answers, Personal Computing, *50 Essex St., Rochelle Park, NJ 07662.*

Q: In the interview section of your September 1982 issue, Jack Tramiel (Commodore vice chairman) says his company makes it a practice to work with independent software companies so software is available for a new Commodore computer when the new machine is ready to be sold to the public. Keeping that in mind, why isn't there software ready for the Commodore 64? Will there be? Should I buy a VIC-20 because of the lack of software for the 64?

A: The development of a new product, be it hardware or software, in the personal-computing field is a complex task. It seems that, by now, almost everyone knows that computer hardware needs software to drive it if the machine is to be a useful tool. The hardware manufacturers know this, too, and so they try to make sure their new machines will have adequate software available.

Sometimes this ideal situation doesn't happen, and the Commodore 64 seems to be a case in point. Commodore wants to get as much high-quality software into the field as soon as it can—and by the time you read this, a series called Easy should be available. And programs for the VIC-20 can be used on the 64. Probably, in the normal course of events, though, the product wouldn't have been introduced until a lot of useful software could be available as well. There are other factors, though, chiefly marketing ones, that may dictate a hardware product's introduction without a lot of supporting software.

The best information we have is that there will soon be a lot of software available for the Commodore 64. In fact, you may see it start to appear even as you read this. InfoDesign (Birmingham, Mich.), in fact, has a line of business software already available.

This company may be the first to follow the tradition of software writers and publishers who write software for those machines they believe will have a large user base. There are a lot of programs for the Apple and the TRS-80 computers for this reason. Since the Commodore 64 is seen by buyers as a good machine, one they would like to have, the software industry should move into the 64 market. This seems likely because of the machine capability at its low price.

First of all, the 64 looks like a very good buy. It has more memory than you can get from anyone else for the same price. Second, it has an optional Z80 card, which will allow it to run CP/M software. There are literally thousands of CP/M programs around (including game software, as readers are happy to inform us). The 64 also has color (16 colors plus 320 by 200 pixel resolution) and music-synthesis capability. That's a lot of capability for the money.

The other option you mentioned is the VIC-20. This is a very popular computer, too, but it doesn't have the basic capability of the 64. So the choice depends on whether you want to do a lot of things that will require large memory, or whether you will be satisfied with a machine with less capability.

Other things being equal, which they almost never are, we think that people should get as much capability as they can reasonably afford.

Capability in the computer field is a function of both hardware and software. Ask your dealer about any introductions of software for the 64 expected in the near future. And ask yourself if you really think you need to run with canned programs before you get into BASIC programming. There are a lot of people around who now use their computers for a host of applications. They got started by just figuring out what their computers can do and then programming BASIC. It isn't really tough, once you get into it.

Q: In the October and December 1982 Answers columns you responded to the question, "Is there any game software for the CP/M operating system?" Were there any further responses to your call for additional sources of CP/M software?

A: Yes. In fact, we've had two more responses just this month. The first letter came from Donald C. Wiss, secretary of the New York Amateur Computer Club. Wiss says that probably the two largest sources of CP/M games software are the CP/MUG and SIG/M public domain software libraries. Between these two libraries there are now 151 diskette volumes of available CP/M software.

Wiss informs us that the diskettes are available from many local computer clubs and can be downloaded from many bulletin-board systems. The SIG/M diskettes can also be obtained from SIG/M by writing to the group directly at Box 97, Iselin, NJ

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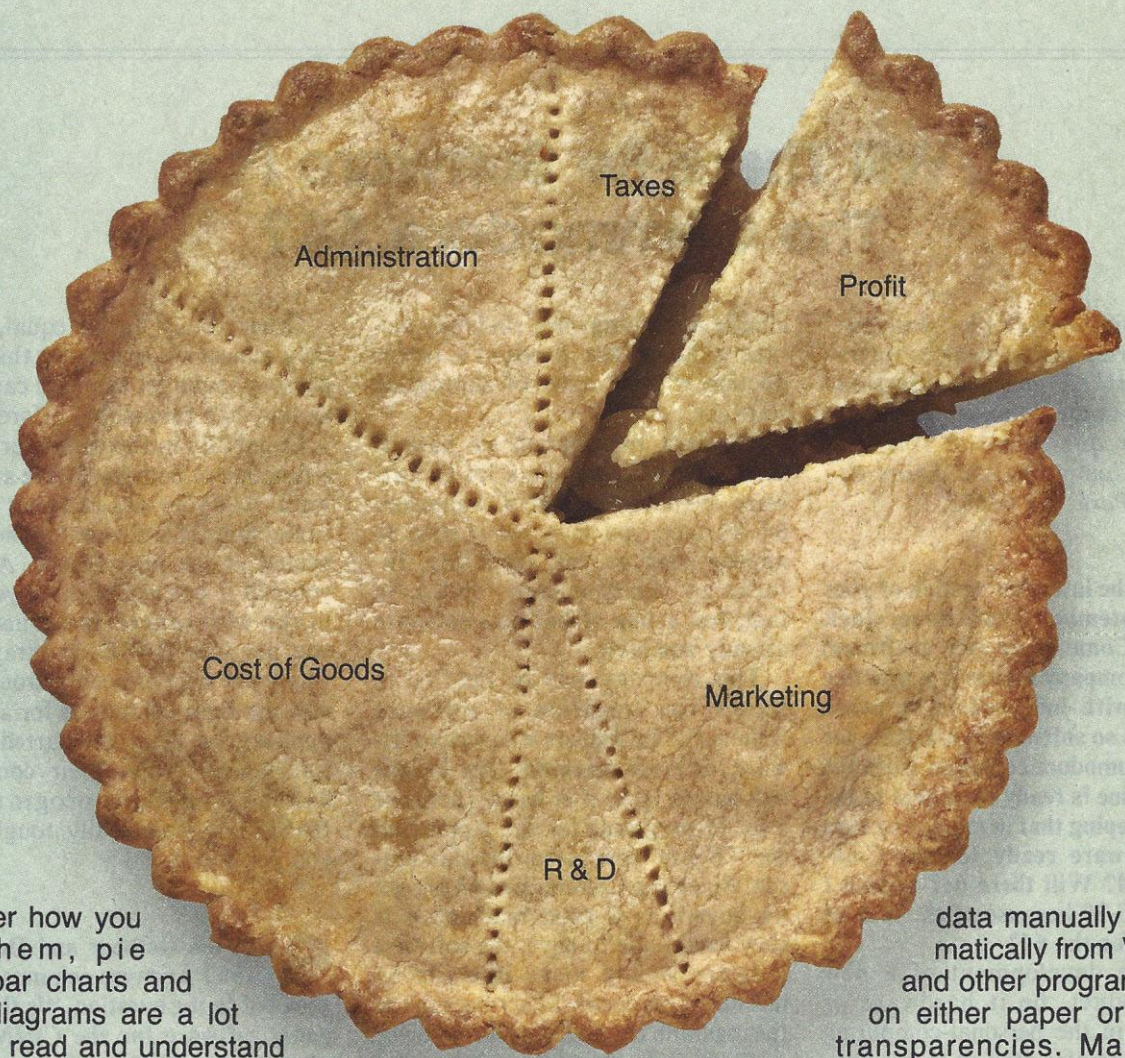

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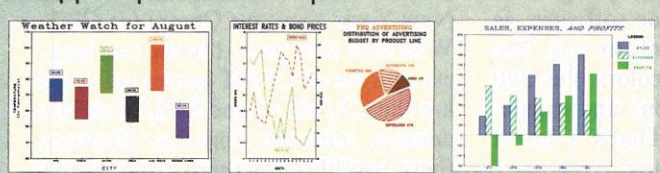

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CIRCLE 7

ANSWERS

08831. The prices are $6 for the first diskette, and $5 for each additional disk. The CP/MUG disks can be obtained from the CP/M Users Group, 1651 Third Ave., New York, NY 10028 for $8 each. The club also has catalogs that document the available programs in the libraries.

Our second letter came from Benjamin Cohen who notifies us that he has located a great deal of CP/M-compatible games that he has implemented on his Osborne I personal computer. Cohen and his family have been enjoying the original Adventure game since they purchased their computer, but, he says, that is just the beginning.

Cohen says that The Software Toolworks (14478 Glorietta Dr., Sherman Oaks, CA 91423) has a plethora of CP/M games including Invaders, Munchkin, Space Pirates, and Mychess. He has also seen Zork I, II and III; Deadline; and Starcross, all from Infocom, 55 Wheeler St., Cambridge, MA 02138.

Have no fear. We are still searching for more sources.

Q: I just bought a VIC-20 and am learning how to program it. Is it possible to program the VIC-20 for record albums and books by Album Title, Artist's Name, Side A (names of songs), Side B (names of songs), and then store that information on tape?

A: Yes, it is. This was one of the principal applications of early hobby computers. People used their computers to store similar information on everything from stamp collections to financial information for their tax returns. So we know it can be done.

We don't presume, though, to tell you exactly how to do it, because we're not intimately familiar with the tape-handling capabilities of the VIC-20. We can tell you, though, that the capability should work in a fashion similar to the Apple's. In a

(continued on page 19)

COMING IN FUTURE ISSUES

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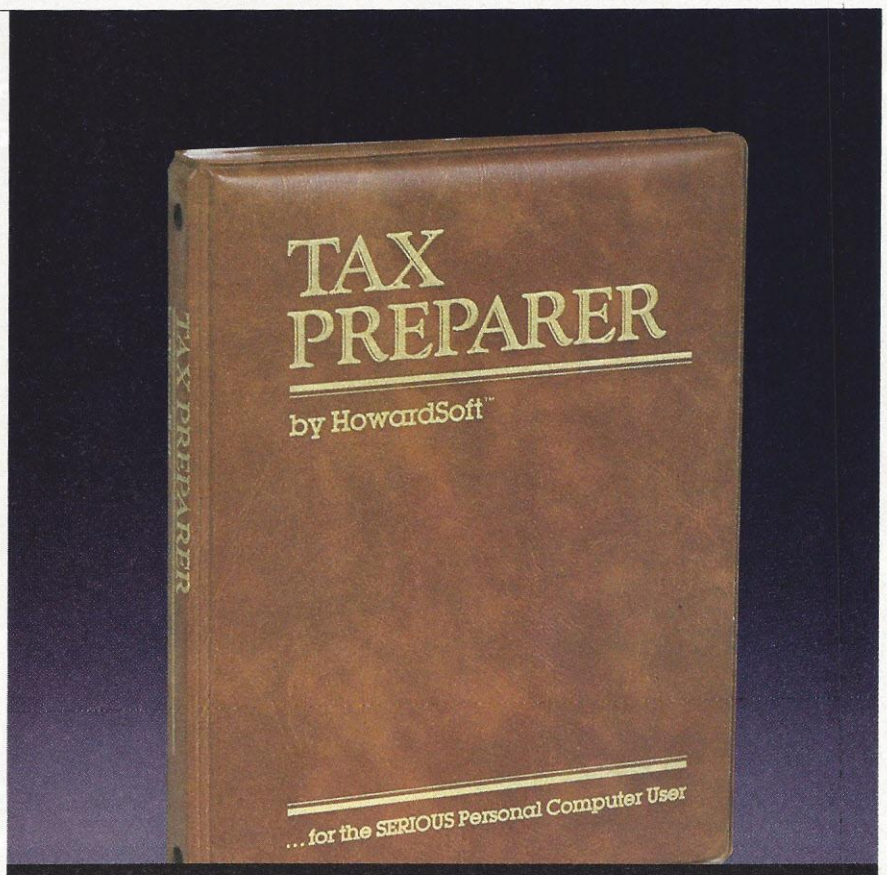

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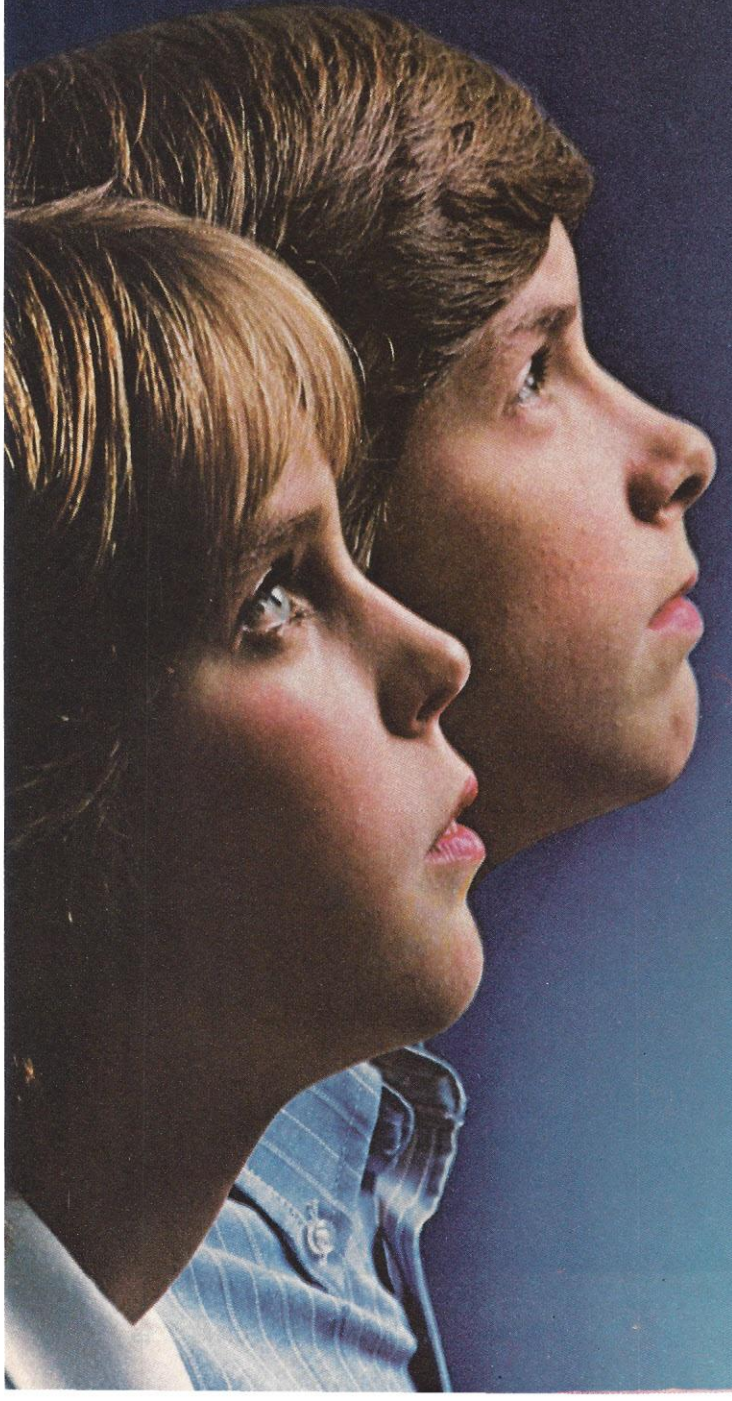

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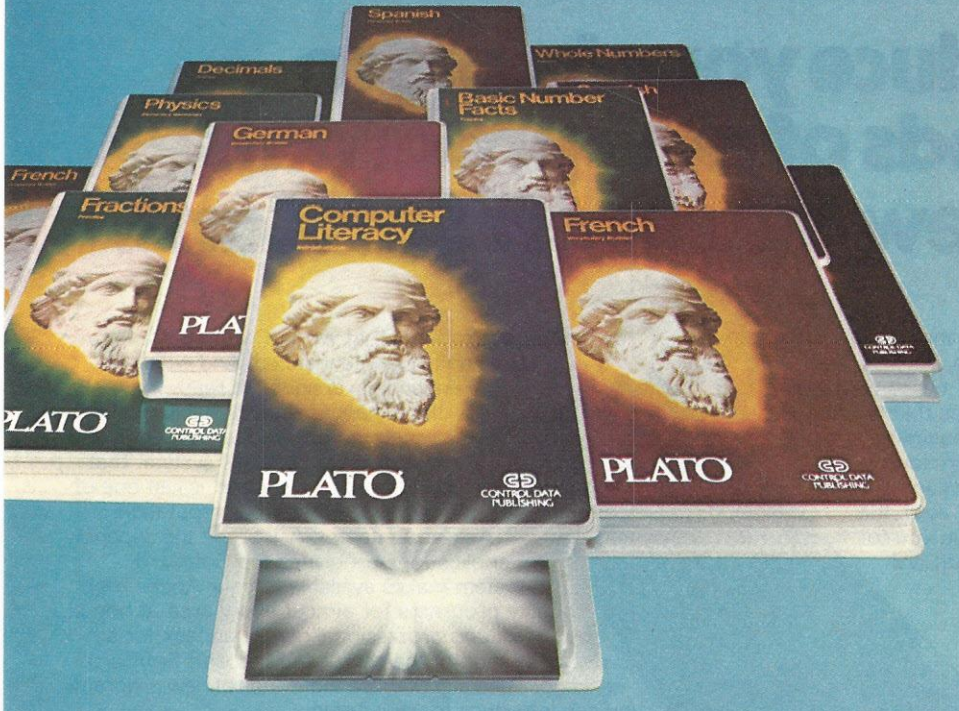

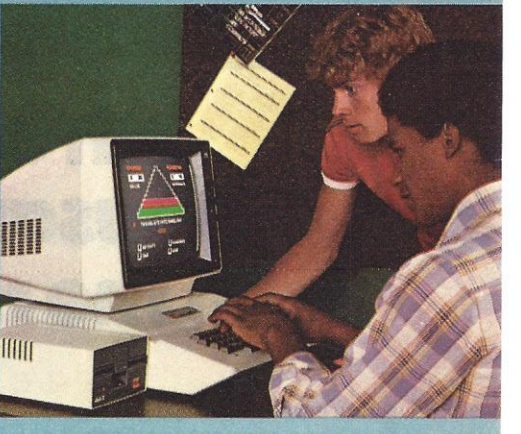

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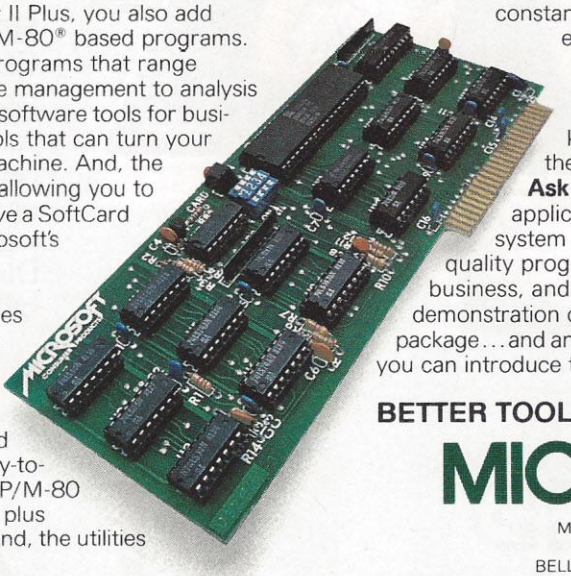

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(continued from page 15)
48k Apple II Plus with Applesoft in ROM, storing data on tape is accomplished with a STORE command, and data are recalled with a RECALL command. These commands only handle numerical values, not strings. We only point this out to show that cassette storage is possible from the BASIC language. Just how it's done, though, is a function of the particular implementation of the BASIC on your particular computer—the VIC-20 in your case.

Q: What is the difference between pixel resolution and the line resolution so often quoted by manufacturers? I saw one monitor that has resolution of 1000 lines, but listed pixel resolution at 560 by 240. Another listed 900 lines resolution with pixel resolution of 900 by 800. Which is more important—pixels or lines?

A: Resolution in a monitor describes how fine a detail you can get in your picture. Pixel resolution describes the number of dots that can be placed on the screen. Line resolution tells you the number of lines that would appear on the screen if the monitor could hold the line resolution it has at center screen.

It's a little confusing, but here's what all this means. In our previous discussion of monitors (see Monitors, the better to see your data with, *Personal Computing*, December 1982), we said that a raster-scan monitor (the kind that you probably will have with your personal computer) creates an image by turning an electron beam on and off. While this on/off action is progressing, deflection circuits move the beam from the top of the tube face to the bottom and from side to side. The faster the beam moves from side to side in relation to the vertical-movement speed, the more lines the beam can draw. The more lines, obviously, the greater the vertical resolution is.

Vertical-line resolution of 1000 lines means that if you took the number of lines per inch at center screen and multiplied that number by the total number of vertical inches on the monitor's screen, the resultant product would be 1000. The catch here is that resolution isn't constant over the screen face. The face of the tube is curved, and that affects the line spacing, as do other factors. As a result, line resolution won't be as good at the top and bottom as it is in the middle of the screen.

Pixels are related to lines. You can't have better pixel resolution in the vertical direction than you have line resolution, because the beam has to be moving on a horizontal line to be able to put a dot on the screen.

Here's how you get pixels: The beam follows the control of the deflection circuits, moving from right to left and top to bottom. But if the software hasn't put the code for a pixel in the information stream the monitor receives, the control grids in the machine keep the beam turned off; no electrons reach the tube face, and no light is generated from the screen. When the code for a pixel reaches the monitor's circuitry, the control grids go positive and accelerate the electron beam enough that the same electrons get to the tube face and a pixel is born. The speed of turn-on and turn-off, a function of the bandwidth of the video amplifier, determines the number of pixels that can be placed on a horizontal line. The faster the amplifier (the wider the bandwidth), the more pixels.

So line resolution and pixel resolution are related. The line resolution is a limiting specification for the vertical pixel resolution. But the horizontal pixel resolution is a function of the speed of the video amp and is independent of the line resolution.

If you want a lot of horizontal resolution, go for high horizontal pixel resolution. Otherwise, look at the line resolution. Remember, though, that the monitor can only display what the computer feeds it. If the video controller in the computer is limited, the best monitor in the world is a waste of money if its resolution is specified higher than the resolution of the video controller.

Q: The question I pose is about the difference in price and memory requirement for what appears to be identical software. The price and the amount of memory required are always higher for a disk version of a program than for the cassette version. Can you explain the difference? Is the cassette version more limited? Or is there more memory overhead for a DOS?

A: Yes, there is more memory overhead for a DOS, if you're talking about an Apple II, as your letter seems to imply. Apple DOS loads into the higher ranges of the memory and takes about 10k of RAM right off the top. In the process it sets HIMEM (a value that tells BASIC how much memory is available) to about 10k less than the highest memory address you have in your system. So if you have a 48k Apple, HIMEM is set to about 38k when DOS boots.

DOS reserves this space to itself so the utilities it needs will be available. Thus BASIC can access all the DOS commands from inside a program, simply by going to this high memory region, where DOS is located, and figuring out what you want to do.

In practical terms, this means you need more memory to run a program that is supplied on a disk than you do for the cassette version. Cassette commands to load and save programs, and to store and recall data arrays, are in the BASIC in ROM that came in your machine. So this storage system takes no overhead at all.

Suppose you want to buy a program that takes 27k of memory when it's running. If it's on cassette, the program will run easily in a 32k machine. But if it's on a diskette, the

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CIRCLE 10

program will need its 27k plus 10k more, for 37k. That means it needs a 48k machine in the disk version.

Q: I was just at my computer dealer's trying to buy a joystick for my Apple II. He wants about $50 for it, and I think that's too high. Is there anything I can do to get a less expensive joystick?

A: There are two or three things you can do. First, you can shop around. There are many brands on the market. Some are more expensive than others. Some dealers will charge more than others for the same product, so just by shopping around you might be able to pick up a joystick for less than the $50 you quote.

If you have a video game in the house, you could take the joysticks for that game apart, and rig them so they work on the Apple. The Apple reference manual says the computer's game controller inputs (there are four in the game paddle port) should be connected to five volts, through a 150 k-ohm potentiometer. The diagram for the inputs is in the reference manual.

When you take the joystick apart, you may find that it isn't a proportional joystick; it may have only four switches in it instead of potentiometers. If that's the case, then you're out of luck on this one, because the game-control inputs demand that resistance input, not a push-button input. You could put the switches across the three push-button inputs, but there's a catch here. Software that's written for joysticks will be reading the game-control inputs for cursor control, not the push-button inputs. So you might have to write special software (not too difficult in BASIC, but probably tough in machine language) to read your homemade joystick. Then, too, the lack of a fourth push-button input means that you'll be missing one direction on your joystick.

If you feel adventurous, you can build a joystick yourself. (Caution: If you know nothing of electronics, please don't try this. *Personal Computing* can't be responsible for what you do with your computer, and it is possible to do horrible things inside when you're fooling around with wires, solder, and other stuff.) Electronics hobby shops sell joystick assemblies in various resistance values. The diagram in the Apple book tells you where the 5V output, the ground connection, and the game-control inputs are in the game-paddle port. Get some ribbon cable (40 conductors arranged in a flat configuration with insulation in between, so the whole assembly looks like a ribbon) and connect the appropriate conductors to the potentiometers. Each potentiometer (pot) has three contact fingers sticking out of it. Put the 5V line to one side of both pots, connecting the pins on the two pots with a small length of hookup wire. The ground line goes to the finger on the other side of the pot, and then you connect the two ground pins together. The finger in the middle of each pot is the one that is connected to the variable resistance inside. The middle of one pot goes to GC0, and the middle of the other pot goes to GC1 on the game-paddle port. After sticking the other ends of the conductors into the right holes of the game-paddle port (Apple calls it the Game I/O connector), you can fire up a program that reads the game port and lo and behold, your joystick works.

Anyway, you can get a joystick for a lot less (about $13) than the retail value you quoted.

Q: I am a songwriter. Could you tell me how a personal computer can help me in my work?

A: Using computers in music is becoming more and more common. From rock groups like the Grateful Dead, to pop writers like Academy Award winner David Shire, to classical composers like Laurie Spiegel, personal computers are being used for both composing and playing their creations.

The best way to get started using a computer to create music would be to read about the subject. *Personal Computing* had an article covering the whole field in May 1982. Also, a recent book, *Introduction to Computer Music* (John Wiley & Sons, New York), by Wayne A. Bateman, offers a comprehensive, complex approach to the subject.

After having your fill of reading about making music on the computer, the next step is to buy a music synthesizer, or board, for your computer and begin to tool away at the keyboard. Some companies that offer computer music products include: ALF Products (Denver, Colo.); Applied Engineering (Dallas, Texas); Insoft (Portland, Ore.); Mountain Computer (Scotts Valley, Calif.); Passport Designs (Half Moon Bay, Calif.); Software Affair (Sunnyvale, Calif.); and Syntauri Corp. (Palo Alto, Calif.).

Q: I would like to use my personal computer in my motor home, which sometimes serves as an office. Will I need special transmitting/receiving equipment for my modem?

A: You won't need any special equipment if your modem can be connected to the public dial-up network. Most modems don't care how you do it; they just want a phone line.

Some modems might have trouble with a radio/telephone link to the dial-up network, such as those you find in phone-equipped automobiles. These transmitting devices would include all the auto-dial and auto-answer modems. This class of equipment looks for a way to pulse or touch-tone dial the destination number and to hook up with the other computer's carrier, or modem, once the connection is made.

(continued on page 163)

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CIRCLE 12

Out-Dazzling A Top-Dollar World

How does a 28-year-old financial manager at Warner Brothers Television in New York City keep track of 400 movies playing on 140 different cable-TV channels across America? How does he determine a reasonable price to charge for the cable rights to films like "Chariots of Fire," "Superman II," "Arthur," and "The World According to Garp"? And how does he avoid falling far behind the competition in a marketplace where cable-TV networks, like Home Box Office, Cinemax, and Showtime Entertainment, spend a total of $600 million annually to purchase movie rights?

Meet John Kleine, a young man on the rise at one of the largest entertainment corporations in the world. He's not afraid to admit that he's riding on the razor's edge of what he calls "a frighteningly big business."

When he arrived at Warner Brothers Television in February 1981, the division kept track of its film properties—what was available for sale, which cable stations were in the market for what—by equipping its accountants with pencils and paper. But fully intent on coming to grips with a relatively new industry that was growing by quantum leaps and bounds, Kleine decided it was high time that his office staff got over its fear of computers or what he whimsically refers to as its "cyberphobia."

To handle word-processing chores, his division had just spent $125,000 on a Wang OIS 140 minicomputer system with six terminals, a CPU, and a disk drive. But when Kleine came aboard, the computer and its peripherals were still sitting on the floor in their packing crates. "I remember tripping over the boxes my first few days on the job," he says. Wasting little time, Kleine set up the system and began showing his secretaries and accountants how to use it, at first mostly for word-processing and bookkeeping functions.

Ironically, though, as Kleine instituted the use of the Wang at Warner Brothers, it became clear to him that he needed a personal computer in his office to properly analyze and manipulate the minicomputer's data. He found that unless he had his own information machine to use privately, to edit the reams of facts and figures pouring from the Wang, the data would just spill out in a disorganized fashion "like movie reels unspooling," in his vernacular. So he purchased an Apple II Plus personal computer with 64k of RAM, two disk drives, and an Epson MX-100 printer to complement the minicomputer and make the sudden maze of information personally useful.

The Wang was programmed to run a series of huge data-base files, including a title file that tracks the financial history and current availability of all films made by Warner Brothers and the Geffen, Orion, and Ladd movie-production companies. It also runs a licensee file that lists the 140 cable-TV clients, monitors the number of their paid subscribers, and tallies a reckoning of past, current, or pending agreements with Warner Brothers. There is a deal file that holds the details of existing contracts, such as how many air plays a client has remaining on a nine-month license to show "Sharkey's Machine,"

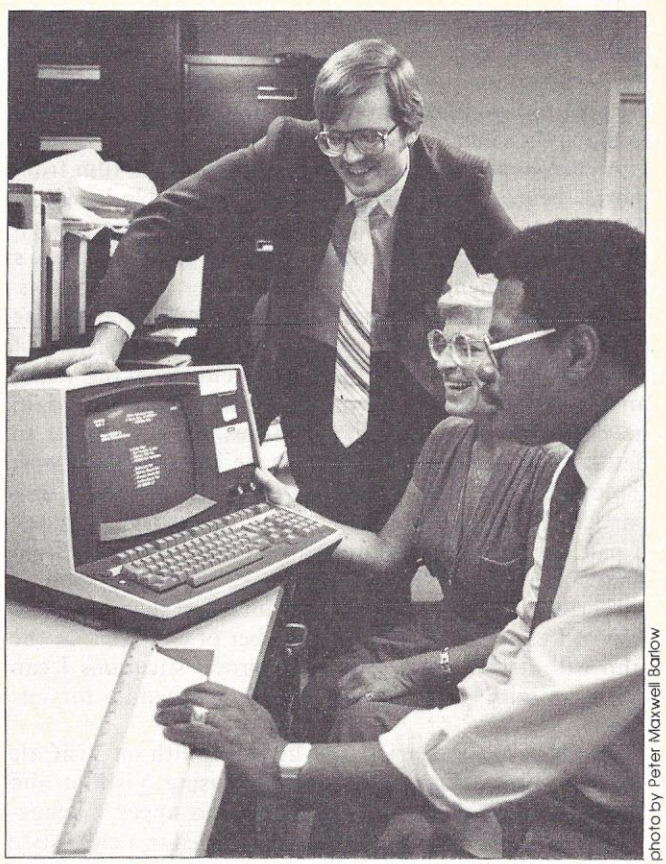


photo by Peter Maxwell Barlow

Data from the Wang (above) are put into Kleine's Apple computer, where the information is used in planning negotiation strategies for selling Warner Bros. movie properties.

and an upcoming file that has on record the cable-TV companies that Warner Brothers does not currently service but could get on contract at some future date.

The road to cable TV for most movies begins around the time of the film's initial theatrical release. It starts with a special showing to cable-TV executives. The timing of this preview is crucial. If the film is a "stinker," such as "Rollover"—a romance about international banking, with Jane Fonda and Kris Kristofferson—traditional showbiz wisdom dictates that the showing be scheduled before the critics get to see it. If the film is well made but about a subject with limited audience appeal, such as "Personal Best"—a movie about women athletes—it's better to wait until some favorable reviews have been written.

"The dollars at stake are astronomical," Kleine says. "One of our customers recently agreed to pay $25 million for the television rights to 'Star Wars.' When the numbers are that big, you just can't afford to be wrong about how to move the film."

A careful progression is necessary to wean a film from movie theatre to television screen in the cable business. The trick to staying ahead, Kleine says, is having enough information at your fingertips to "choreograph" a movie's revenue statement.

Enter the Apple. After the special screening, Kleine takes the information relating to size and sales history of prospective interested TV-network clients from the Wang and inputs it into his personal computer. From that data he plays a host of what-if scenarios, using VisiCalc to determine which type of contract he can negotiate with these networks. "If Home Box Office is interested in a particular film, for example, it's nice to know how much it paid for a similar film in the past and then work from there," he explains. "I can forecast the expected growth of subscribers to the date of our first intended showing of the movie. I can then predict the number of viewers that the film will attract. And with these prognostications I can come up with an attractive payment schedule for our film."

Many of the scenarios that he plays with on VisiCalc end up being turned into graphics, using VisiPlot and VisiTrend. By showing these reports to upper management, many of Kleine's ideas are presented in a clear style that gets his point across without a lot of excess statistics.

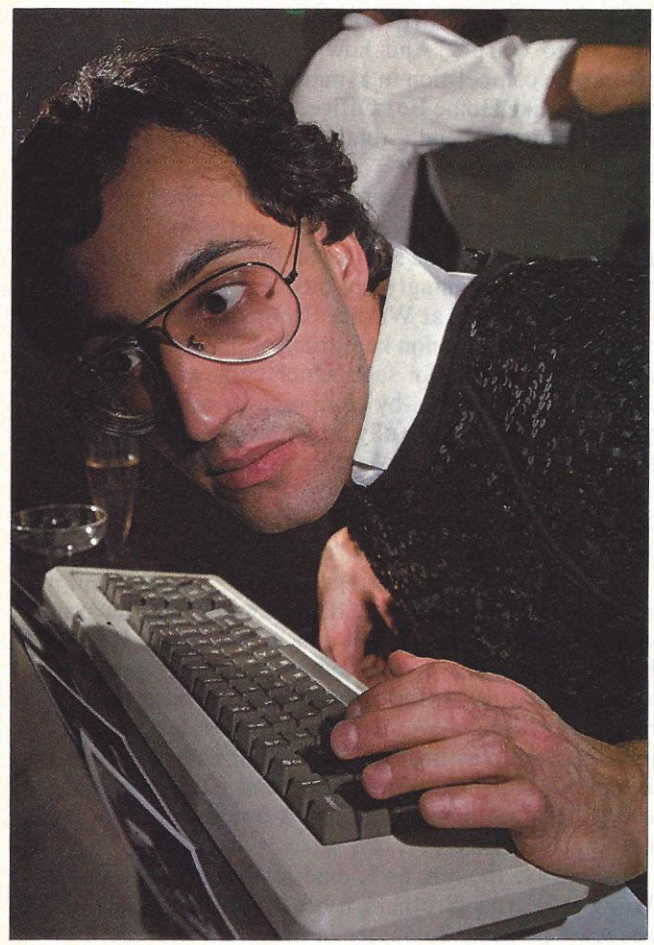
Kleine chose the Apple computer over the other personal computers for a simple reason. "I have a theory that I try to live by," he says. "Beware of low serial numbers. The Apple has been around for a while and it's well-supported. I don't want to be the first one on my block to buy a certain kind of computer and let it blow up in my face."

Though Kleine may be conservative about the type of computer he purchased, his way of dealing with the razzle-dazzle, top-dollar world of cable TV and films is anything but staid. The faster he can move facts and statistics around to turn them into clear-headed policy, he feels, the greater chance that he will win the gamble posed by the already high stakes and competition.

—Mike Barlow

AMID THE FLASH AND PANACHE A STAR IS BORN

The stage was set for nothing short of a grand media event when the long, black limousine eased up to the curb. There was an explosion of light as the photographer's strobes went off in a staccato of something approaching approbation. The crowd shoved forward to catch a glimpse of the man wearing sequins and glitter, the focus of the kind of hoopla that's usually reserved for Hollywood's biggies.



Burke Campbell, a man with a flair for promoting his ideas, feels he has made a revolutionary statement with his novel.

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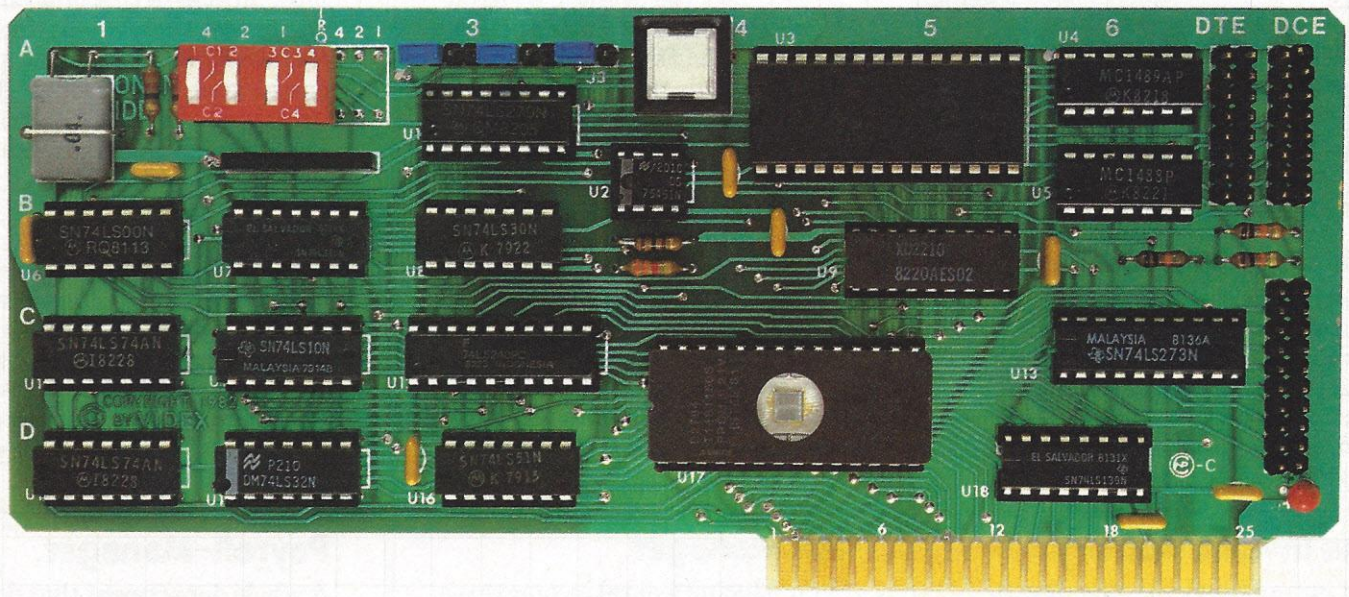

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CIRCLE 13

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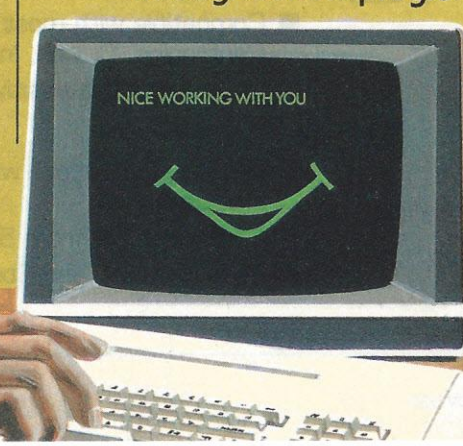

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CIRCLE 95

If Toronto's staid Artculture Centre was an unlikely choice for the boom and bang, the cause was even more unlikely: A full-blown novel was to be written entirely on an Apple III personal computer—in less than 72 hours.

The star of this literary event was one Burke Campbell, a writer for the Canadian Broadcasting Corporation's radio show "Nightfall," and a man with a flair for promoting his ideas.

Blind Pharaoh, the name Campbell picked for his torrid potboiler, has "some mystery, some humor, a lot of dirt, gossip, beautiful men and women, and a great deal of money." The plot, which sounds remarkably like a TV soap, spins its web around two artists, and an anonymous benefactor who rescues them from the perils of having to earn a buck by the sweat of their pretty brows. The catch in Campbell's standard cast of characters is the benefactor, Pharaoh, a person who bears a striking resemblance to the writer himself. The length of the novel? As Campbell explains, "One page, but it goes on for 700 yards."

Yet, underneath all the hype, Campbell had a serious purpose in mind. In *Blind Pharaoh*, he feels he has made a revolutionary announcement. "We have entered an age in which literary information can be transmitted to the consumer almost instantaneously," he says. "Television, radio, and the phone are all right there in the home. Literature does not come into the home unless you go out and buy it." Electronic publishing, Campbell thinks, will change all that.

"Books will become as easily accessible to the individual as television or radio entertainment," Campbell says. "A lot of people think this is a stunt, or some sort of gimmick—but this is really just a different method of disseminating information."

Campbell is, perhaps, on shakier ground when he talks about the instantaneous critiquing of electronic publishing. "The reader can participate in the critique, whereas before, this was the exclusive domain of those in the media. We've broadened the area," he says.

Never one to miss a deadline, Campbell began work on his novel Sunday evening, November 14, 1982, with his Apple III loaded with an Apple Writer III word-processing package. He finished his labor on Wednesday morning, less than three days later. By 10 a.m. Thursday (Eastern Standard Time), *Blind Pharaoh* was ready for transmission on The Source.

Although the likes of Hemingway or Proust might raise an eyebrow at the thought of composing a book in 72 hours, Campbell is no stranger to the "fast novel." Last year, during the Labor Day holiday, he participated in a three-day writing contest sponsored by Pulp Press in Vancouver, Canada. "I had so much fun that I thought I really must do this all the time," he says. "I want to repudiate this lie that an artist must suffer for his art."

To prove his point, Campbell made sure there would be adequate amounts of bubbly on hand. "There's only one way to get truly psyched up," he says, "and that's on Dom Perignon. How could anyone *not* write a masterpiece on Dom Perignon?" Indeed, as Proust would undoubtedly sigh. Indeed.

Although some writers feel that such generous indulgence in alcoholic beverages hinders writing abilities, Campbell disagrees. "If you're in control of things, and have created an environment of love and warmth, and created your own deadlines, you can do the impossible," he says.

Such comments cause one to wonder about the after-effects of the gala event. Campbell admits they are "still looking for survivors . . . but those of us who are alive thought it was wonderful!"

Admittedly "a very nervous person who doesn't like to put up with frustration on any level," Campbell made sure that on this occasion his only worry would be writing. His meals were catered and he was basically "waited on hand and foot."

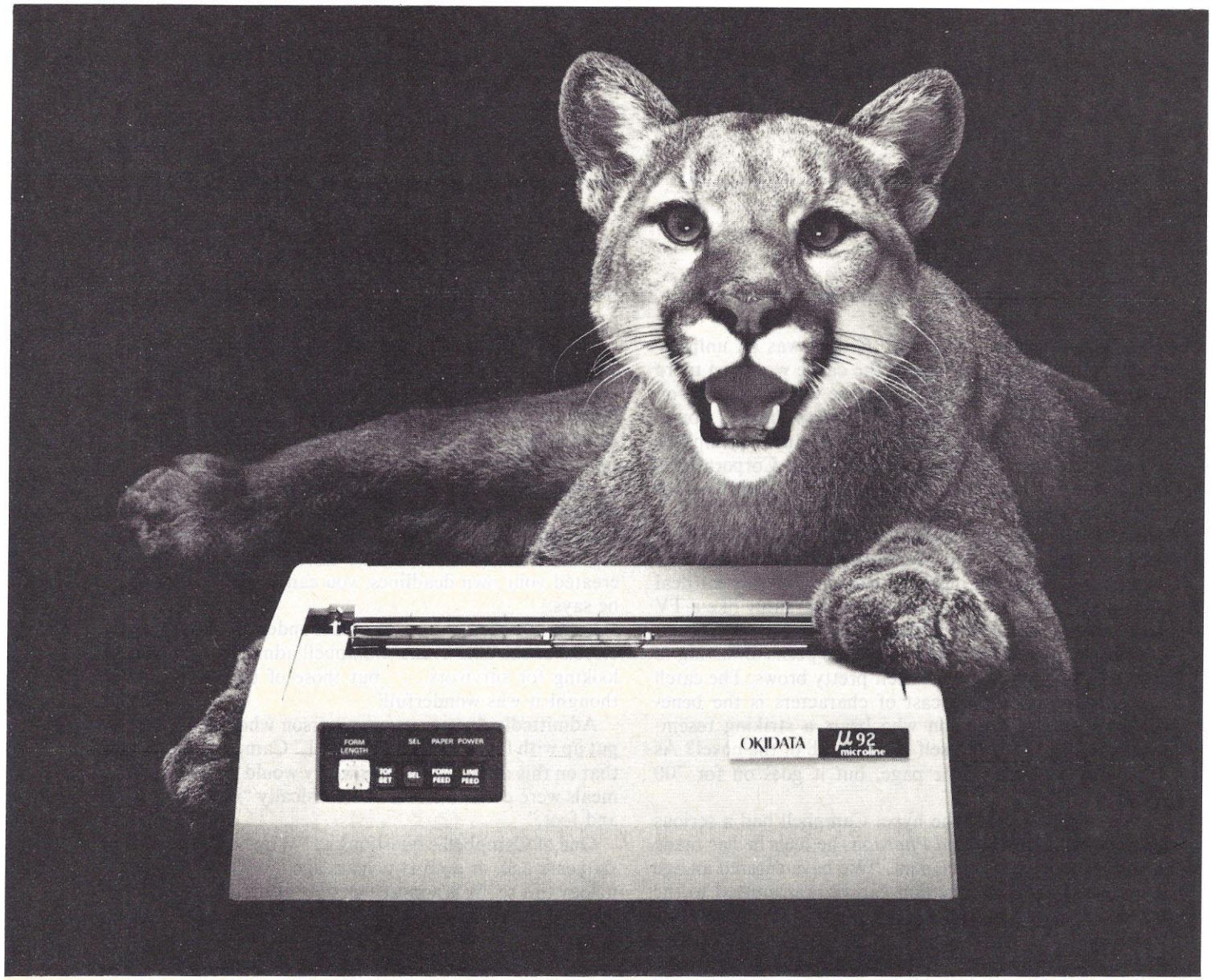
One of Campbell's questions is, "Why wasn't this done six years ago, or even two years ago? With today's technology this really is a most everyday event. People are still stunned that one individual in a city could write a book and send it out all over the world." Such technology cannot be overlooked, and Campbell is positive about his future career as a novelist. "One of the nice things about the electronic revolution is that rather than being confined to one city, I now write for the world."

Campbell, in his very own style, seems to have paved the way for electronic publishing as a new field. "This is entirely my own concoction," he says. "I contacted everyone. People have been flabbergasted that one person put this all together." And indeed, it was Campbell who contacted both Apple and The Source. Consequently, Apple Canada Inc. agreed to lend Campbell an Apple III personal computer with Apple Writer III word-processing software for the event.

As for specific future career plans as a writer, Campbell did disclose one. "What I would really like to do is go up in the space shuttle Columbia and write a novel. I think they've got an Apple on board." Campbell says that at the moment, he believes they're doing "some type of vegetative experiments," and he "doesn't want to be upstaged by a turnip."

STATE GOVERNMENT CLEANS UP ITS ACT

One of the biggest concerns of people in these United States is the quality of the environment. State and local governments across the country are involved in locating and cleaning up potentially dangerous hazardous-waste sites to make our country a safer place



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Like all Okidata Microline printers, these two new high performers are built strong to keep on running, right down to the print head that's guaranteed for one full year. But the really great news about each is price: $699 suggested retail for the ML 92; $1249 for its big brother. Absolutely purrrfect.

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All Okidata printers are compatible with Apple, IBM, Radio Shack, Osborne and just about every other personal computer.

CIRCLE 14

to live in. But there are many variables to consider and tabulate when determining whether or not a particular hazardous-waste disposal site is dangerous and should be cleaned up. Here's where the personal computer comes in. William B. DeVille, Louisiana's director of policy development for the Office of Environmental Affairs, uses his Apple II Plus personal computer with a variety of software packages to aid in the search for trouble.

A couple of years ago DeVille's office in the Louisiana state government was developing a comprehensive hazardous-waste regulatory program. To adequately develop the program, information had to be compiled to help predict the various types of industrial waste that are generated by different kinds of industries. Access to the state's mainframe was practically impossible, so DeVille decided that the Apple II Plus personal computer he had at home would be the perfect tool for accomplishing his task. Some simple revisions to a file-management program and a few hours spent entering data scrounged from a number of sources worked wonders.

"Perhaps the greatest advantages to using a personal computer," DeVille says, "are that I can browse through information, ask questions in different ways, and discover new ways of analyzing and using data. The exercise of examining industry patterns of hazardous-waste generation and management has helped me make some decisions on regulatory development."

The first thing DeVille does when looking for potentially dangerous hazardous-waste sites is go through all available literature on waste generation by industry type and format the information into a data base. Then, using the U.S. Environmental Protection Agency's hazard-making model and VisiCalc, he just lets the Apple organize the information for him.

Some of the 100 independent variables DeVille looks for, which he enters into the model, are: the quantity of waste involved; the toxic state of the waste, which be found in standard handbooks on waste products; and the probability of migration or movement of hazardous substances from a site, which involves the subsurface geology of the area and location of the nearest known uses of well water there. Scoring algorithms that exist in the model for each variable then point up possible target impacts of the migration of waste products.

Above all, DeVille uses his Apple for word processing. His job requires the drafting of potential new legislation, regulations, and the development of technical manuals. As might be expected, draft regulations and governmental technical manuals go through many successive drafts. Since DeVille tries to adapt the final document to comments and criticisms, both pro and con, a professional word-processing program makes it easy to change and edit the text.

For his word-processing needs, DeVille uses the Word Handler from Silicon Valley Systems in Belmont, Calif. He feels it is fast and easy to use. The printed output from the program is professional looking and has full right-margin justification, with incremental spacing on the printer. For instance, last summer DeVille did research for a series of documents for a federal agency. Using a Qume letter-quality printer, the proposals came off the Apple disks, camera ready. Then the agency's print shop reproduced and bound them, providing polished-looking reports.

"I vastly prefer using the Apple, compared to a dedicated word-processing system," DeVille says. "This computer can be used for word processing one minute and converted to a file-management system the next."

To assess certain industry patterns of hazardous-waste disposal, DeVille uses data-base management software called DB Master from Stoneware in San Rafael, Calif. He uses SIC codes (Standard Industrial Classifications) to assess the generation of certain types of hazardous wastes. To develop the reports on these patterns, DeVille combines the word-processing and data-base management programs.

DeVille also uses his Apple II for word processing at home. He writes numerous articles in the environmental area, particularly on legislative management and the cleanup of abandoned waste-disposal sites, many for the National Governors Association and for state regulatory associations nationwide. He is also writing a book on the history of environmental legislation in the 1970s.

DeVille has also introduced the Apple to the staff of the agency for mailing-list purposes. The list contains 2800 names and is broken into 13 subcategories according to interest. If one of the decision-making bodies of the Environmental Control Commission plans to have a meeting, a mailing to all interested parties is required. The list was first implemented on the Apple with the DB Master data-base management software and then transferred to List Handler (another product of Silicon Valley Systems) because of the speed of the package.

Long before the dawn of personal computing, DeVille was project director of the Environmental Systems Applications Center, a technical-information center at Indiana University. Large-scale information searches were done at the requests of state governments and large industries in the Midwest on a CDC 6600 mainframe computer. "There was no direct interaction between the user and the data base," he says. "Our group had to provide that interaction. It worked, to a degree. But it was clumsy (Did we really understand the user's interests?), slow (10-day response time was considered fast), and relatively expensive."

The Apples DeVille uses every day are much smaller than the computer he used 10 years ago. "Yet the power of use of the Apple," he says, "is much greater than the

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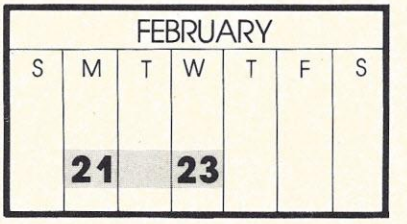

mainframe, with the right software, for the applications I really need every day. That's cost-effectiveness."

PERSONAL COMPUTING TAKES THE BUGS OUT OF A PEST CONTROL OPERATION

Programmer/analyst Gerald Jewel was saddled with a sticky problem. His company, Ace Pest Control, needed to decentralize its debugging operation. Headquartered in Culver City, Calif., Ace has three branch offices located in other towns in the Southern California area. For about four years, the firm's computing power resided in one IBM System 34 minicomputer located at the company's headquarters. Branch managers had to access this system for all pertinent client information, such as billing status and how often facilities are exterminated.

Communication between the large computer and the field operations was slow, and branch officers were hindered in the acquisition of up-to-the-day, client-account information they needed to service their customers effectively. The managers desperately needed reports delivered to them on a daily basis, not once a month. The only solution to Jewel's information-retrieval problem was to install some kind of computing system at each location. But which system should he choose, and what kind of configuration would best meet his company's needs?

At the beginning of 1982 Jewel decided to turn to personal-computer technology for the answers to these questions. He took into consideration the fact that the people who run the company's branch operations need daily updates on company information relevant to their territory in order to make decisions locally.

In some companies this information-retrieval exercise can be handled by a personal computer equipped with a floppy disk drive. But in a busy operation such as Ace's, any one office's data bases could be larger than a personal computer's floppy disk drive could store on one diskette. Floppy-disk storage also forces users who are trying to locate a particular piece of information to find the appropriate diskette first. Then, sometimes while a customer is hanging, they have to get the diskette into the drive and wait while the computer accesses the data. This waiting process can irritate clients and be otherwise difficult, especially while a telephone receiver is jammed between one's ear and shoulder.

Realizing the additional problems floppy disk drives could pose for Jewel's operations, he turned his thoughts to the advantages of hard disk drives. The speed and large storage capacity of the drives would make it relatively easy to bring computing power to the branch offices. Transmitting data to these drives from the central office through a modem was still a problem, though. Most personal-computer modems run at a slow 300 baud, which means that even transmitting data at night would bring about high phone bills. Jewel also had to solve the problem of getting the IBM 34 to "talk" to the personal computers in the branch offices, since the IBM used a different communications protocol than the personal computers do.

Jewel researched the personal-computer market and decided that the Apple III with ProFile hard disk drives, Ven-Tel (Santa Clara, Calif.) 1200-baud modems, and protocol converters would best meet his company's needs. When the systems were first installed, Jewel was nervous about the reactions he would get from the field, but he now feels this arrangement has been well-received by the branch offices. In fact, he says, "Branch managers feel like they've died and gone to heaven." Before the introduction of the Apples, managers received reports three weeks after they were useful—now reports are received weekly, and soon they'll be received daily.

All did not run smoothly, however. The first ProFile Jewel bought for his development system in the Culver City office had some errors in the installation instructions, so the initial setup of the system took a lot longer than he expected. Also, no software was available to integrate the IBM with the 1200-baud modems and the Apples—so he wrote it himself.

Backup was another problem. The branch managers had no easy way to make copies of the Winchester files that hadn't already been copied onto floppy diskettes. But Apple's Backup III program solves that by automatically dating files and letting users automatically select files for backup on the hard disk drive by using one of several modes, Jewel says. Backup III also has a method for automatically sequencing large files onto floppy diskettes.

So far, only one ProFile has gone down in its six months of service. And the home-office drive has been running programs day and night since it was installed.

One of Jewel's first projects with the Apples was automating the pest-control company's data acquisition concerning rat traps. The company setup includes an on-site computer installation at the client location and a service that relays rat-trap data back to one of Jewel's Apples at Ace's headquarters. This still-secret device relays a signal to a storage medium each time a rat trap is sprung. The computer samples this stored information periodically and registers how many traps, and which ones, have sprung at a given site.

This device allows Ace to put traps in hard-to-check places, since the traps only need checking when something is in them. It also helps sensitive operations, such as food and drug plants, improve their relationships with federal regulatory agencies, because the plants can give the agencies more accurate data, instead of relying on periodic trap checks.

(continued on page 35)

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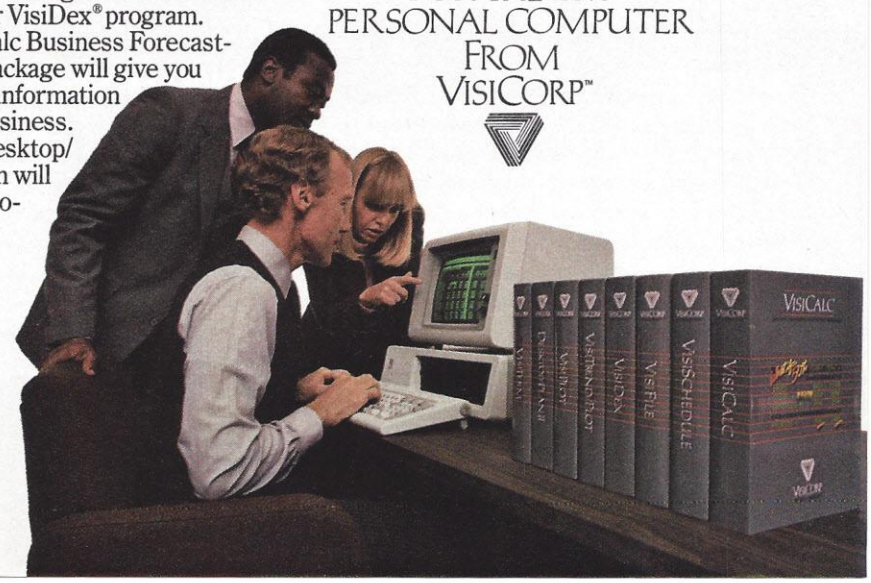

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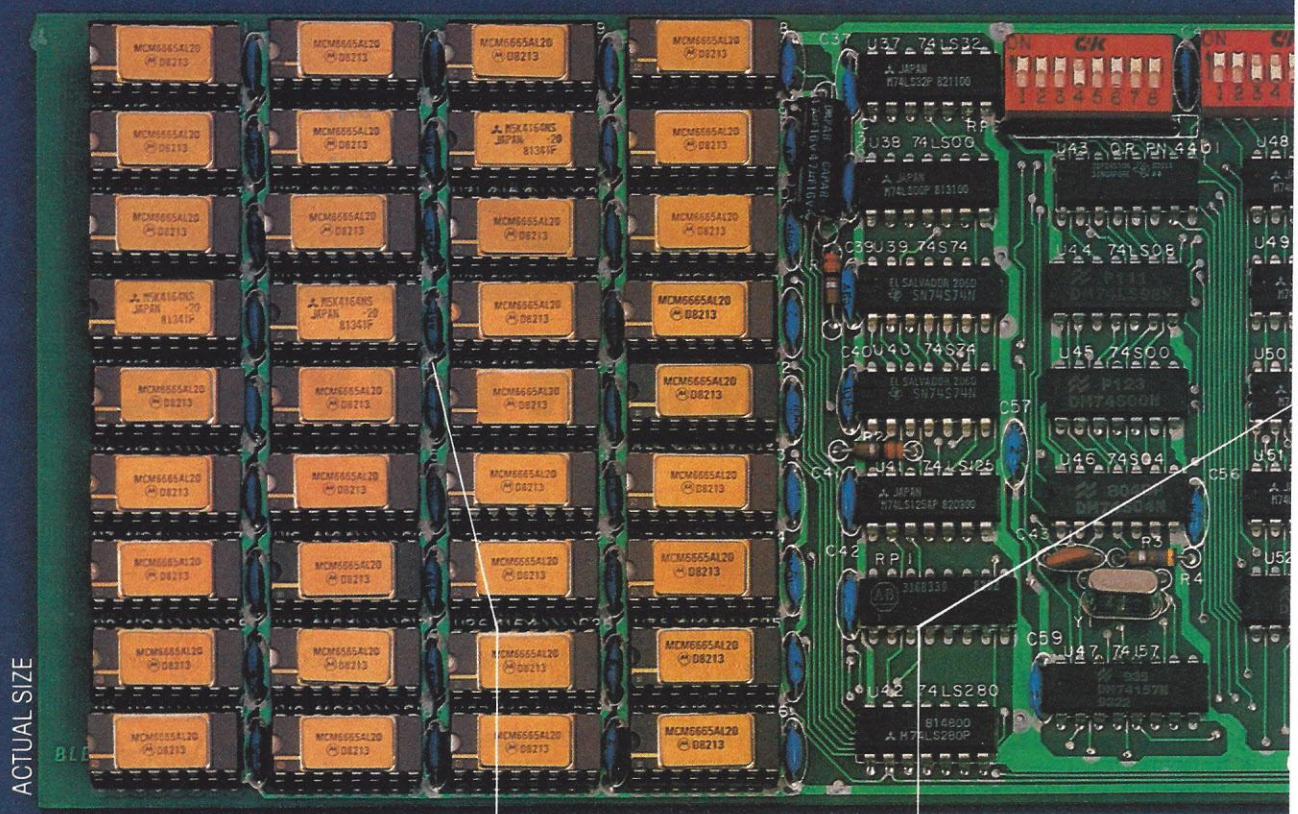

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CIRCLE 15

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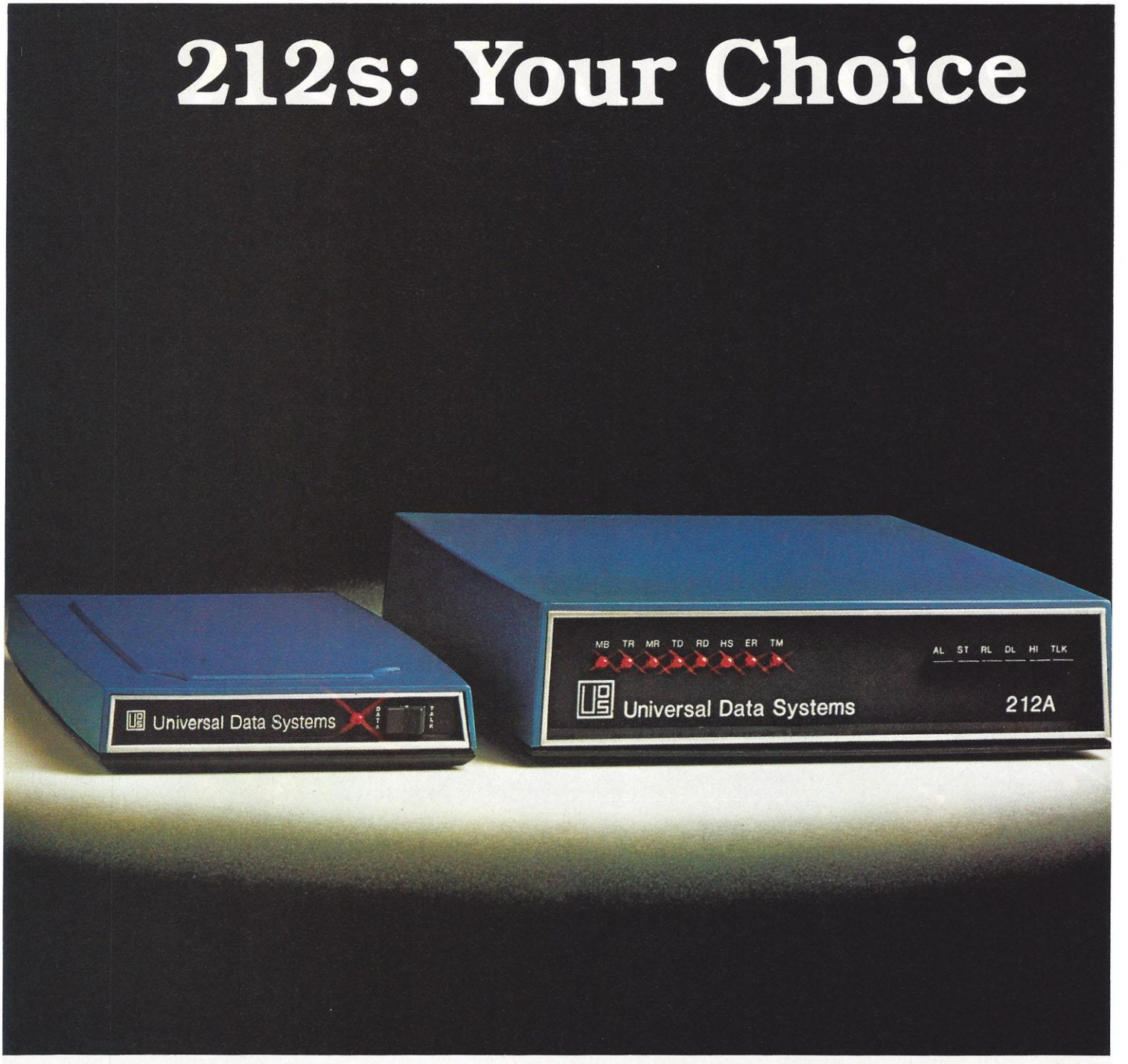

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CIRCLE 16

Created by Dayner/Hall, Inc., Winter Park, FL

(continued from page 30)

By mixing off-the-shelf hardware and some very original thinking, Jewel has helped empower Ace Pest Control's branch managers and operatives with the information they need by giving them larger and timelier data bases through a hard-disk system. While much of the operation could have been handled by a floppy-disk setup, Jewel avoided any future data congestion by using the right tool for the right job. In the process he has made his company efficient and able to service its clients' needs.

PERSONAL COMPUTER SCORES A GOAL WITH HOCKEY ORGANIZER

In the United States, the passions of little boys run in the direction of Little League baseball, and more recently, soccer. But in Canada, the favorite pastime is hockey. And they take their hockey very seriously.

But with any "little league" there has to be some kind of organization, and the organizers are usually the parents of the "little leaguers." George Mess, the data-systems supervisor for Kalium Chemicals in Saskatchewan, got involved in community hockey organization several years ago when his son Kelly joined a league.

Last year Mess found himself getting buried under paperwork. Registration forms for 250 boys for the Regina, Canada, community hockey league had turned to small white mountains on his desk. Consequently, Mess decided to put his Apple II personal computers to work and designed a program for hockey registration.

Hockey organization is no easy job. The youngsters of the Glencairn Minor Hockey League are divided, by age, into six different divisions. Mess is the coordinator for the Tom Thumb division of 9- to 10-year-olds.

Registration involves filling out several different forms and taking fees, which took Mess almost an entire evening. "If a parent had three boys playing, he'd have to get in a different line for each boy."

The overall paperwork job was immense, and keeping track of payments and receipts was a special problem. Along with a general registration fee, which ranges from $35 to $75, many of the boys purchase $10 hockey sweaters. In addition, consent and liability forms, as well as registration sheets, have to be filled out for each youngster.

But with two Apple II personal computers, two monitors, two disk drives, two black and white television sets, and two Centronics dot-matrix printers, Mess was ready for action. "I developed a system that entered all of the players' names, ages, phone numbers, and addresses," says Mess. If the boy was a return player, the registration data was immediately accessible for confirmation.

"One problem with hand writing paperwork is that you always make mistakes," Mess says. Whether it was simply a mistake in the player's phone number or age, he was constantly rewriting things. "My intent was to enter the information once and have it confirmed."

Despite computer simplification, Mess admits that he "lost a few pounds the night before using the system. I was afraid it wouldn't work," he says. "But everyone assured me that it was much easier." Previously, there were hold ups in the registration lines, and the computer streamlined it all.

The evening of registration was not without problems, however. "When you register the child," says Mess, "you make the bill out to the adult. But sometimes the child's last name and the adult's last name are not the same. I hadn't accounted for some of those kinds of situations." Mess hopes that by next year all the problems he hadn't anticipated will be ironed out.

Registration is not the only aspect of hockey Mess has simplified with his personal computer. He is also involved with game scheduling. Each team plays 24 games a year, and Mess had to schedule 450 hours of ice time for those games. The computer saved him time, because it allowed him to change things easily. Since new schedules can be printed out easily, game changes did not create problems.

Game sheets used to record penalties are another aspect of hockey Mess has computerized. Previously, a game sheet had to be written up on each player, at every game. Now all of this information is retained by the computer.

Computerizing hockey sounds like a time-consuming business, and Mess concedes to having spent between 100 to 150 volunteer hours designing the registration program. "I don't want to sound like I'm responsible for this whole thing," says Mess. "A lot of people put a lot of work and effort into this hockey program. I see this as my contribution to it."

STUDEBAKER'S RESTAURANT: A CAR IN THE LOBBY AND A PERSONAL COMPUTER IN THE LOUNGE

Riddle: What has a vintage Studebaker in the lobby and a state-of-the-art electronic cash-register/personal-computer network behind the bar? The answer is: Studebaker's restaurants, located in Mobile, Ala., New Orleans, La., and Jackson, Miss. The chain, which is owned by Yesterday's, Inc., and includes Yesterday's restaurant in Mobile, has recently purchased four Victor Vanguard electronic cash registers (ECRs) for each location, and a Victor 9000 business computer.

But these outlets are just the beginning. Yesterday's plans to open a Studebaker's restaurant every six weeks for the next 18 months, with the next coming to Baton Rouge, La. The Yesterday's chain presents a new variation on the standard restaurant format. It offers extensive cocktail-lounge facilities, featuring a vast variety of

drinks and hors d'oeuvres that are served from a 16-foot buffet. The food is free during Happy Hour (from 4 to 8 p.m.) and sold at a moderate charge after that. The real charm of Studebaker's and Yesterday's, though, is the congenial—and slightly funky—atmosphere, along with light food and beverages.

Running, and especially expanding, this new kind of "pub" requires a highly efficient accounting network and literally up-to-the-minute information on sales volume, station, clerk, and even brand productivity. To meet these needs, Gene Gunn, the chain's manager of operations, turned to Victor Business Products and a network of Victor Vanguard electronic cash registers at all facilities, linked with a Victor 9000 business personal computer and a larger mainframe system at the home office in Mobile.

Gunn had three main considerations in selecting the cash register line—report capability, reliability, and ease of operation. Each electronic cash register, both behind the bars and at various stations around the lounge, gives continuous reports on gross, net, and total sales; average sales by department; and media reports (cash, credit card, and house charge). In addition, the network is able to track productivity by restaurant, department, station, drink, brand of drink, hour, and individual staff member on a continuous and immediate basis.

With this information Studebaker's can adjust its operation on a daily basis to increase profitability. Gunn points out that management constantly redesigns the floor plans and alters the number and locations of stations, based on the data they receive on the pattern of sales by time and place.

COMPUTING DOWN CAREER PATHS

Jim and Barbara Florini both use personal computers in their work at Syracuse University in central New York State. Jim is a professor of biochemistry, specializing in the area of control of muscle growth. Barbara, the director of the university's Center for Instructional Development, works with administration, faculty, and staff to improve the quality of instruction.

This computing couple has been involved in many different levels of computing literacy—from working with sophisticated graphics plotting and data analysis, to the basic and essential teaching of the use of personal computers in instructional development.

Jim uses his Apple II Plus to help him prepare for scientific meetings he attends, to discuss his research in biochemistry. "It's not classroom in the usual sense, but very advanced education," he says. "What happens in science is that scientists who have done work that other people find interesting are invited to go to other universities and talk about their research with that school's staff."

Florini has written almost all of his own software. "We do a lot of data calculating and text analysis, as well as text editing in the lab. I use a Pascal system as a text editor. Then I take advantage of the system's capabilities to analyze data for reference citations and have all of the information detailed and automated."

When giving seminars about his research work, Florini has to present the data in an organized and detailed fashion. "I use the Apple to draw all of the graphs and figures I use for my presentations, and I even make slides from Apple printouts.

"I swear, I've spent most of my life deciding, with a piece of graph paper, whether one division of a graph is five units or ten units or whatever. With automatic plotting software, the Apple takes care of that chore for me," he says. "The software is written so it fills the screen with the largest element in the graph, which saves me a great deal of time, since I do a lot of data plotting."

Helping people understand what computing can do for them is Barbara's exclusive province. According to her, "You can't talk a whole lot about instruction these days without someone bringing up computers. One of the things that I'm interested in finding out is the way that computers fit into instruction in ways that make sense."

When Barbara gives workshops and presentations on computing literacy, she often addresses people who essentially have no background in computers.

"It seems that no matter who I'm talking to, or what the background of the person is, or even what their level of education is, for introductory purposes everybody is looking for that same kind of core of information," she says. Sometimes this core of information is just basic vocabulary. "One person came in and said to me, 'Am I the only person in the world who doesn't know what a floppy disk is?' I said, 'No'. But he sure was feeling that way.

"It does no good to talk to a person about all the wonderful qualities of a disk drive if the person doesn't know what a disk drive is in the first place," she says. "When I work with adults, I really start at a very elementary level. None of it has anything to do with a person's basic intelligence—it has to do with a basic knowledge of the framework of computers."

In addition, the facility Barbara heads has an open-door policy for students and faculty interested in learning about computers. To aid in the initial exposure of novices to the machines, Barbara and the staff of the center have written some introductory program materials for beginners on the Apples, TRS-80s, Ataris, and Osbornes that are available there. "These programs are intended to help the person through that first hour or two, when so much time is lost," she says.

Jim and Barbara Florini represent a family whose career paths have been enhanced by the value they see in personal computers for themselves and for others.

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It's an ad for NEC's APC™ Advanced Personal Computer. A solutions-oriented system that solves business problems in the simplest, most cost-effective way. The APC supports both CP/M-86™ and MS-DOS.™ It can store more information than any system in its price range. In short, it's got the best price/performance of any personal computer. That's why our competition would pr[illegible]at you never see our syste[illegible]

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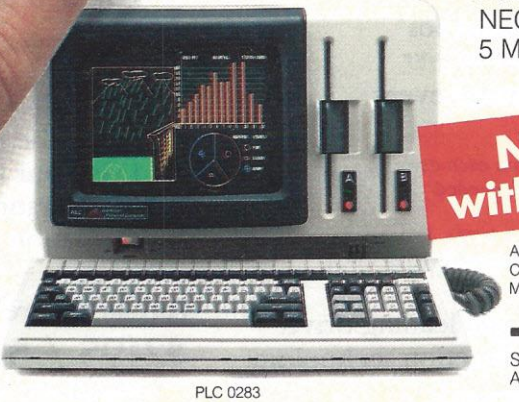

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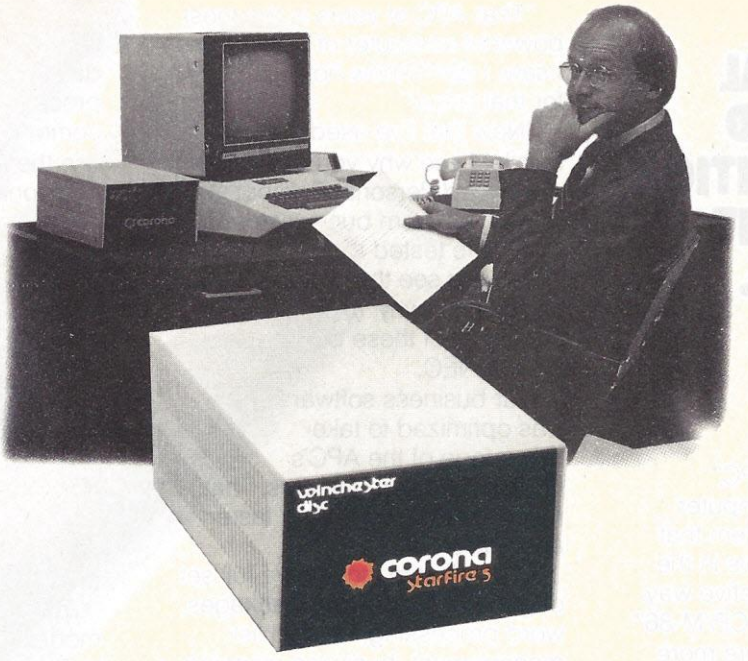

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CIRCLE 19

Dennis Hayes On Data Banks, AT&T, And The Future Of Telecomputing

Dennis Hayes built his first modem on his dining room table in 1977, at a time when personal computing was strictly the province of hobbyists. But six years later Hayes' communications products, which now include fast-speed, 1200-baud modems and powerfully sophisticated software, have become some of the cornerstones of telecomputing, a concept that has gone far beyond the needs of gadgeteers.

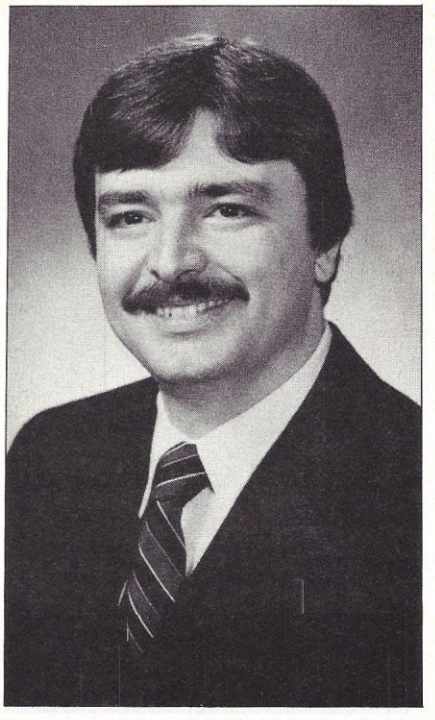
Telecomputing on the personal computer, which includes everything from computer-to-computer communications, to electronic mail, to accessing remote data banks, is opening up the gates for widespread information exchanges shared by personal-computer users of all kinds. Because of data-communications tools like Hayes', ideas are being exchanged, professional productivity is significantly enhanced, and information is available cheaply and quickly to anyone willing to hit a few computer keys.

Since 1977 Hayes' firm, Hayes Microcomputer Products, Inc., based in Norcross, Ga., has developed 300- and 1200-baud modems—the Smartmodem and Micromodem lines—as well as increasingly sophisticated computer-communications software to power telecomputing. In terms of software, Hayes has reached a kind of a pinnacle with the just-released Smartcom II. While the Smartcom II expands the personal-computer user's sphere of communications, it also cuts through a lot of the difficulties that have at times made efforts at telecomputing a cumbersome chore.

With all of this, Hayes Microcomputer is a growing concern. The company's sales for the year which ended last September were in excess of $10 million. And when Hayes talks about the future, he predicts sales for his company of close to $200 million by 1988.

When we spoke with Dennis Hayes, he was in the middle of the whirlwind of press briefings and product-marketing efforts that accompanied the introduction of Smartcom II. Excited by future prospects for his business in particular and telecomputing in general, Hayes talked about the information revolution, AT&T, electronic banking, and the widening range of computerized communications.

"Electronic mail is just beginning to be understood. It will have a significant marketplace."



Let's start at your beginning. When did Hayes enter the personal-computing marketplace?

Hayes: In April 1977 I thought modems provided a niche in the computer market that I could easily establish myself in. As a physics student at Georgia Tech and a summertime worker with the telephone company, I was interested in communications networks and how to get access to them. I was frustrated by the lack of good available equipment to do the kinds of communicating people wanted to do on any level of computing.

The first thing I developed was a modem board for the S-100 computers, the first personal computers. At that time they were the Altair and MITS machines. Pretty soon there were dealers lining up to sell the modems, and it just took off from there. The company actually started on my home dining room table, where we put the boards together. Before I knew it, it took over the whole house, and we had to move out. We moved into our first full-scale manufacturing facility in April 1978. In those days we wanted to do both the hardware and software, but we had all we could do to meet the demand for the hardware products—the modems and the boards.

At that time did you think that personal computers were going to take off the way they did?

Hayes: I knew that a lot of people wanted to have computers, but it was mostly hobbyists who were interested

in them. It was impossible to predict that we'd get to the point we're at now. The fact is that when we first started selling modems, I got lots of calls asking me what they could be used for. Of course, that's all changed now. Today there's a growing awakening to the fact that telecomputing is available—that all you have to do is plug your computer into a modem, boot up some software—and there's a whole world of useful services that you can call to get relevant information. I think a lot of people who buy personal computers are realizing that the computer gives them a competitive advantage over their peers without computers. In the same way, they're beginning to realize that the data-communications capability—the telecomputing capability—is the first step in using that advantage.

Specifically, what types of advantages does a personal-computer owner get out of telecomputing?

Hayes: Let me give you an example. I attend a class called the School of Management and Strategic Studies that's given by the Western Behavioral Sciences Institute. We go to La Jolla, Calif., twice a year for a week and have regular seminars. Between those seminars we use a teleconferencing system called EIES, for Electronic Information Exchange System, that's operated out of the New Jersey Institute of Technology. This way, over computers, we conduct the equivalent of a classroom session. The student boots up the computer and reads his classmates' comments about whatever subject is the current one. Then he writes his own comments in response. With telecomputing I'm able to participate in coursework and take classes that would be impossible otherwise, because I just wouldn't have the time. That's an educational example.

There are other, more professional, examples, too. Say you want to do research. Being able to reach a data base like Dialog gives you immediate access to more bibliographies than most libraries have. Or there's the Dow Jones News Retrieval and The Source, data bases you can access different types of information than Dialog from, whether it's airline schedules or stock prices or the news. It's also interesting to note that the biggest use of The Source is for electronic mail—sending messages to subscribers over the computer. I think electronic mail is just beginning to be understood, and that it will have a significant marketplace of its own.

So what you are saying is that telecomputing multiplies the amount of productive time in a day.

Hayes: Yes. In effect, it gives you much more efficient utilization of your time, because you're able to get the information when you need it. I might want to know a stock price when my broker's closed. That's no problem if I have access 24 hours a day to that type of information through Dow Jones or a similar data bank. That 24-hour information availability can be worth a lot of money to me. Telecomputing allows me to use information when I need to, without having to wait for some outside company or service to be available to work with me.

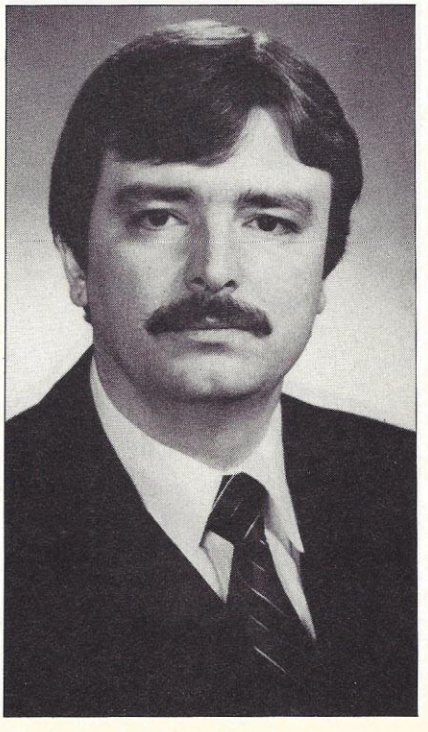
That describes one of the basic tenets of personal computing—it really gives you personal control over the information you need at the time you need it. One of the problems with telecomputing is that it can be a cumbersome task requiring many different computing actions and commands. Some newer products, though, appear to be an attempt to finally wipe out telecomputing complaints. Could you elaborate on that?

Hayes: There are newer products like the Hayes software, the Smartcom II, that will make most of the difficulties of telecomputing a thing of the past. Though initially it will be available for the IBM Personal Computer and Xerox 820, in time we plan to implement this program on several other computers. This program simplifies the tedious process of accessing a data base and makes it as easy as, say, word processing can be. It allows the user, with a few key strokes, to sign onto a network, then sign onto the information service, get the information he wants, and hang up, minimizing total connect time and cutting down appreciably the number of keystrokes that is the norm today.

Smartcom II has in it what we call communications sets. A communications set consists of a series of dedicated communications parameters—such as passwords and telephone numbers. This will allow, for instance, an automatic data-bank log-on sequence by pressing one key, among other things.

Does that mean that contacting

"AT&T will play a role in telecomputing. But I'm not convinced that its service will be less expensive."



CompuServe, Dow Jones, The Source, or any of the others will be like booting up a simple software program?

Hayes: Almost. To make it easy to get started, Smartcom II is already set up to make a direct connect to a data base. You may have to put in the data base's phone number, but that's about all you'll have to do. We wanted to keep this software as simple as possible to use. We tried to make it easy to know what's going on at all times, and what each step is all about. We also included a comprehensive HELP function. Any time that the screen prompts you for an entry, you can hit the HELP key and it explains what it's asking for.

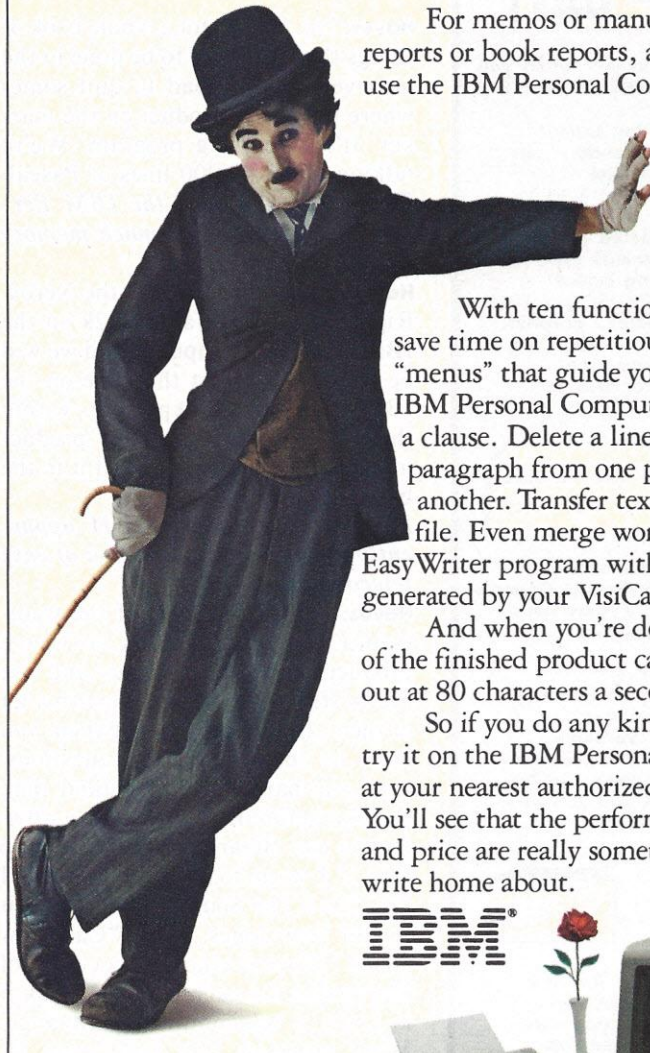
There is documentation, and I want people to use it. But I suspect that anyone who's experienced in using his personal-computer system could probably throw the manual away and just run the program. You should be able to follow your nose through the program if you're reasonably computing literate.

Can you give us an example of how a typical personal-computer user would use Smartcom II?

Hayes: Let's say I owned several blocks of stock and I wanted to check the price on those every day. I can set the program up so that it's just a couple of key strokes to call The Source to check the movement of the portfolio. This is because the software will automatically go through the menus at the information utility. The traditional method of doing this would require physically reading the menus, choosing the proper category, and then choosing the subcategory and the sub-subcategory, etc., until you get to the information you want. Smartcom II will automatically step through all the menus—if the communications macros are set up—and carry you directly to the information you want at the data base.

Can you program it so that the computer can initiate communications on its own at the appropriate time?

How to move a paragraph.



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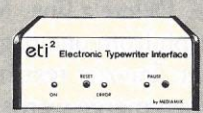

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INTERVIEW

Hayes: No. We've got a whole book of things that still need to be done in the next version. We had to quit somewhere to get the product on the market. It's a very big program. We're talking about 40,000 lines of Pascal.

That's why you need the IBM Personal Computer. How much memory does it take?

Hayes: We got it in 64k on the Xerox. Right now it takes about 92k on the IBM Personal Computer, and we will be introducing it at that size on the IBM. But we are expecting, within three or four months after product introduction, to be able to fit it in the basic 64k.

Products like Smartcom II apparently augur a new generation of easy telecomputing.

Hayes: I think so. Some of the traditional communications software products use simple menus and are pretty straightforward. But with a lot of them, every time you use them you have to answer a dozen questions, each one harder to understand than the one before it. They've been difficult to use. Smartcom II is set up so that if I want to call The Source, I say, "Call The Source," and if I want to call Dow Jones, I say, "Call Dow Jones." Since it takes just a couple of key strokes for each action, I think it is truly a telecomputing advance. With products like Smartcom II, people will see that using telecomputing is really to their advantage.

What effect does a product like this have on the personal-computer marketplace in general? Does it, like VisiCalc, sell more computers? Is it going to alter the way people do things?

Hayes: Some of my friends who run the computer companies will tell you that modems and their software are sold because computers are sold. But I remember one woman I talked to at last year's West Coast Computer Faire. She said, "I just bought one of your modems." And I asked her, "What type of computer are you going to put it on?" She said, "I don't know, I haven't bought the computer yet. But I knew I had to have a modem."

I think that data communications *is* helping to sell computers. It's not a major issue. It's not that 50 percent of them are being sold because of data communications, but probably somewhere on the order of 10 or 15 percent of computers are being sold for applications related to some kind of data communications. And I think that number is going to be increasing this year.

It's hard to discuss telecomputing without considering the potential influence of AT&T on this field, now that Bell has been freed by the courts to participate in the computing marketplace. Where do you see AT&T fitting into the telecomputing scene?

> *"There's a lot of potential for (using) telecomputing to access banking information."*

Hayes: I think it will play a very strong role in telecomputing. AT&T has already done some experiments related to voice store-and-forward in which the telephone company, in effect, has your telephone answering machine in its office. And I think if you extend that into telecomputing applications, AT&T can do the same with data. It can basically store computerized messages and forward them when they're called for—clearly, a form of electronic mail. Or it could handle electronic message distribution. Say, for example, we wanted to send a message via computer to all the dealers of our products. They could provide the kind of service that would allow us to send them a list of addresses via computer that they could deliver a specific

message to. Those are fairly straightforward, simple concepts.

But I'm not convinced that AT&T's service is going to be significantly less expensive than anybody else's. For one thing, the telephone company has a very large bureaucratic structure, and while it's making significant moves in reorganizing, that structure just can't change overnight. It's going to take several years for the AT&T bureaucracy to change its method of operating.

Another thing is that generally, the telephone companies have served as AT&T franchises for so long that the parent firm really doesn't seem, at the moment, to be competitive in selling products. It's hard to buy service and equipment from. And it's going to have to get a lot better at that before it is really competitive with some of the other available data banks and future electronic-mail systems.

I guess a Bell phone store isn't like a retail store yet.

Hayes: It's not like walking into a Sears computer store. But the company's technology is wonderful—don't get me wrong.

So one possible plan for AT&T, then, would be to also build computers and to sell them to people—to set up a network in which their communications node, the store-and-forward machine, is in the company's central office and its satellite computers are in people's homes.

Hayes: Yes, but I think AT&T will have dumb terminals for home use that can only access certain preset information files, rather than computers for home use.

I also think that AT&T will have to compete with the cable companies. One question that I get asked a lot is, "Are people going to use cable TV to do the things that you're currently doing with modems over the telephone?" This is the so-called Videotex. In some cases they are, but for the moment only about 25 percent of the homes in the U.S. have cable. Al-

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CIRCLE 27

most none of the businesses have it. There are some cable companies that are targeting business customers, but that's going to be the very high-end user—people who have to transmit a lot of very high-speed data. It's still going to be efficient for a lot of managers who have telephones already, to use that telephone circuit to communicate from their personal computers to their information utilities, to other personal computers, and in a lot of cases, to the company's mainframe.

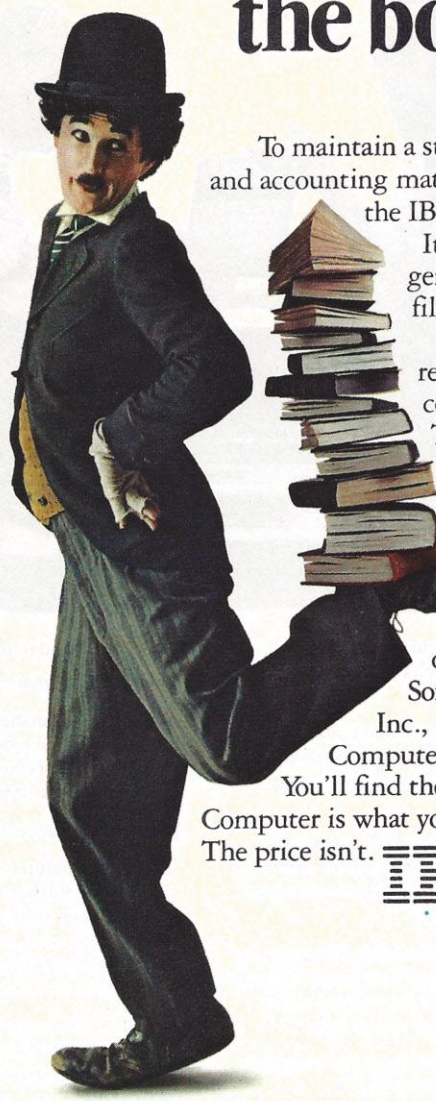
Leaving AT&T, what other kinds of telecomputing do you foresee in the near term?

Hayes: There are a number of banks that are conducting experiments in electronic banking. I think there's a lot of potential for widespread public use of telecomputing to access personal banking information. It's conceivable that you could manage your cash assets more effectively that way—particularly since some of the banks are starting to offer money-market funds, discount brokerage services, and those types of things. You should be able to look, via computer, at your checking account and your other investments, and determine how you want to allocate your cash resources among them. You could also pay your bills.

There are a number of experiments that involve either part or most of these types of activities, which are going to become very available over the next couple of years. I think some of the banks have the impression that they have to provide the hardware equipment to the customer, but that's wrong. I think they need to look at making their systems operate with any type of computing equipment that can communicate with ASCII codes over the dial-up network.

There are some questions related to security that have to be worked out before businesses get involved in this. But there is a strong incentive for a bank's frequent, large users to jump into banking by computer. For instance, if these firms have financial

How to balance the books.



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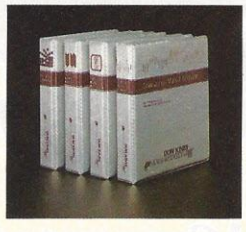

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Hayes: Well, we're seeing pilot projects right now. It's going to move pretty fast. I think by 1985 we'll have seen enough electronic funds transfer that the general public will be aware of it and have access to it, to some degree. One of the things that we've got to be careful of here, though—and one of the reasons that I'm glad AT&T is also getting into the telecomputing act—is that full-scale telecomputing will not be possible if the networks don't plan to increase their capacities. It is possible, after all, to swamp the communications networks with a huge data-communications demand. That's why I'm glad to see AT&T getting involved—because the company will be able to ensure that there's enough capacity to handle what I see as a rather large increase in demand.

The whole industry's got to work together. Of course, it's very competitive. But, in a sense, the capacity of the whole network has to grow to allow us to sell more of our products so that easier connection to the network is made possible. If low capacity bottlenecks the growth of telecomputing, then the cases of use and availability will not be there—and the customer will be less satisfied and will turn away from the concept of telecomputing.

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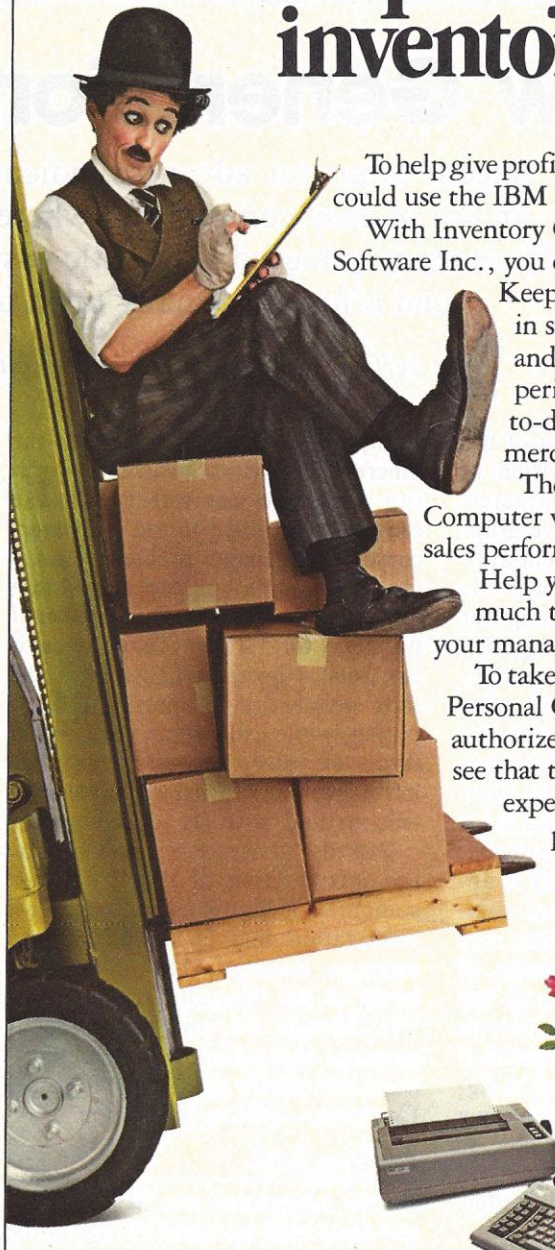

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CIRCLE 26

ESSAY

A New Generation Arrives

Recent computer advances indicate that an era of easy computing—where more efficiency is achieved with little cost in time and effort—is finally upon us

by Jeffrey Rothfeder, Associate Editor

James P. Philbin, president of the electrical instrument division of Eaton Inc., in many ways characterizes the typical chief executive grappling with the enormous potential of personal computers. Though he knows that the personal computer could open the door to a simplified approach to painstaking and complicated, long-range business projections, he hasn't yet found the key that unlocks the mysteries of the machine for himself. The Apple computer he bought months ago sits in his office unused. "The only thing of consequence that I've done so far is approve the purchase of personal computers for my company," Philbin says ruefully. "We've bought enough of them to outfit me and many of the managers under me. But I haven't really used mine yet. I played with it for nearly eight hours, trying to figure out the electronic spreadsheeting process, but I haven't been able to understand what the computer can do nor make the computer understand what I want it to do."

The situation is mixed within Philbin's division. Some of his employees and managers are working adroitly at the keyboards of their machines; some won't touch them, unsure how to begin. As for James Philbin, he's determined. "I'm going to have to learn to communicate with the machine, because I need it," he says.

What Philbin is wrestling with has been an unfortunate consequence of the personal-computing experience. Many people have put up with the inherent difficulties involved in working with the computer because they're determined to use it to overcome management problems and a growing mountain of paperwork. In a sense, they have exchanged one set of problems for another. On balance, it has been a good exchange. But the first generation of personal computing, while awesomely powerful in terms of catalyzing efficiency, has left its residue of frustration on those who battled with its idiosyncrasies.

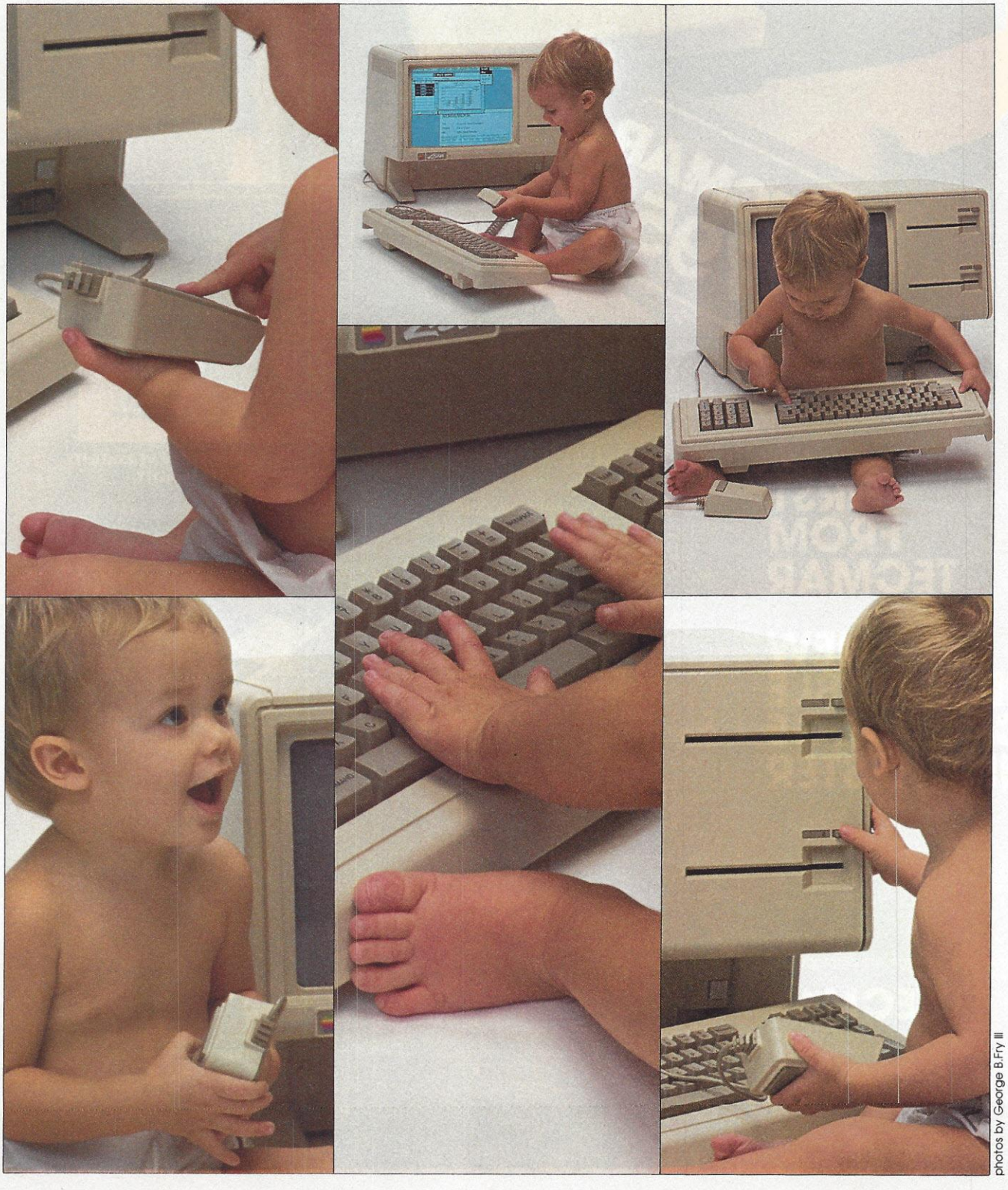
But that generation is now over as the introduction of Apple's LISA computer, a high-powered executive workstation that is not difficult to manage, denotes. Also, the popularity of the "friendly" Commodore VIC-20 and 64, and other recent personal computing achievements—some tied closely to the IBM Personal Computer—add to this notion.

Looking back

A new computing era has begun—one that could be called the age of the "easy computer"—and it promises to make Philbin's problems relics of a bygone day. He won't have to learn how to communicate with the machine anymore using its terms, because the machine now has been commanded to communicate on people's terms.

The virtues of the personal computer are obvious. Since its first appearance in 1976, it has succeeded in taking the vast potential of computing power out of institutional control and putting it into the hands of individuals. In effect, the personal computer has remolded the enormous information explosion of the past 10 years and—while not debilitating it—tamed it into a form that enables everyone to share the power.

But its virtues notwithstanding, the experience of working with the personal computer too often has been difficult and tedious. Much of the blame for this is attributed to the fact that the personal computer was the invention of technologists who cut their eye teeth building and working with mainframe computers. Consequently, from its manuals, to its keyboard, to its basic way of operating and "thinking," the first generation of personal computers was burdened by an electronic shorthand that is better-suited and more understandable to mainframe managers—institutional computing professionals—than to the individual who wants to plug the machine into an AC socket and make it perform. The inability of the personal-computer user to communicate with and understand the computer using the concepts that make up his own, everyday language and actions has been a nagging frustration for many otherwise satisfied users. And this frustration has added up to a hidden cost within personal computing—one that can be measured in the time and effort needed to learn to use the computer well, and in the fact that some would-be users have been dissuaded from buying a machine at all.



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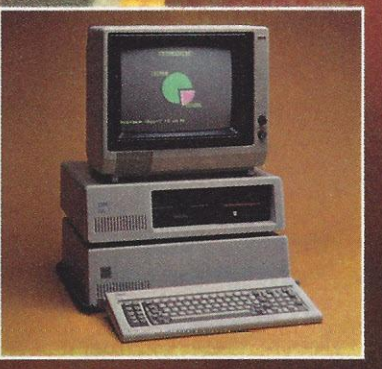

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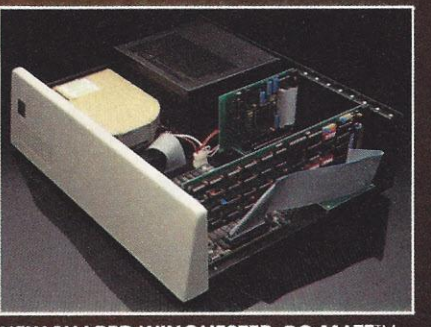

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CIRCLE 17

"The burden has always been on people to meet the computer, rather than on the computer to meet the user."

As Nels Winkless, a long-time computer observer and currently a member of the Savvy Machine Language team at Excalibur Techologies in Albuquerque, N.M., puts it, "Up to now, there have been no mutual ground rules. The burden has always been on people to meet the computer, rather than on the computer to meet the user. It's been difficult for many to accomplish a meeting of the minds with these things."

But with the arrival of the easy computer, all of this is changing. Those difficulties that were grudgingly accepted as part of the personal-computing framework, because the machines were so clearly an improvement on what existed before, are finally being resolved. It has been a quick and radical evolution, considering that the history of personal computing only began in 1976.

A true benchmark

With the announcement of Apple's LISA, the era of the easy computer has gained another benchmark with which to measure future machines. And it's not only LISA; there are other recent machines and software that serve as impressive examples of the arrival of this new easy-computer age. The Corvus Concept from Corvus Systems (San Jose, Calif.); the Fortune Computer from Fortune Systems (San Carlos, Calif.); the Wang Professional Computer by Wang (Lowell, Mass.); the Savvy Machine Language by Savvy (San Mateo, Calif.); the 1-2-3, all-in-one business package from Lotus Software (Cambridge, Mass.); the MBA interpreted package from Context Management Systems (Torrance, Calif.); and the VisiOn "operating environment" from VisiCorp (San Jose, Calif.)—the last three developed with the IBM Personal Computer in mind—all of these bear testimony that the easy-computer concept has found its way into many important products of the past year.

The secret of the easy computer is generally contained in a more powerful interaction between software and hardware than ever existed before. Everything from special function keys, using a mouse as an input device, human-style communications and language, and a range of computing abilities never before achieved on the personal computer are set in motion by truly accomplished programming.

But that's the technical angle. More important, what the easy computer means for the personal-computer owner is that there is finally a device that not only serves his purposes, but also cuts through the barrier of resistance between him and the machine. The easy personal computer crosses the intimidation gap and meets man on his side of the line, in his own territory. In speaking to movers and shakers of the easy-computer age from Apple to Wang, the sentiment is consistent: "What we have attempted to create is a computer that knows how its owner thinks and constantly tells its owner how to make it do what he wants it to do."

How, then, can you recognize one of this new breed of computers? At first glance, when the machine is initially unwrapped, it will not look very different from the personal computers you're used to seeing. But from the moment you start to use the machine and begin to integrate it into your life, the differences will be obvious.

Documenting itself

At its most basic level, the easy computer is one that people can use without training, a personal computer that offers built-in self-documentation. The most obvious example of this is the intelligent HELP key that is prominent on the new Wang Professional and Fortune computers. This is a dedicated slot on the keyboard that is always at the same spot, no matter which software package is being used. It allows the user to avoid memorizing the cryptic commands required just to get to the HELP function on many of the older computers.

After pressing the intelligent HELP key, the user can indicate what he would like aid in doing. He's then given a series of simple prompts, at the end of which the computer offers the solution to the user's problem. The kinds of questions that can be answered by the HELP function can be anything from "How do I add five disparate columns with varying percentages to my current spreadsheet?" to "How do I transmit a message to New York City from my office in Dubuque?"

And for those who are still lost even after a solution to their problem is shown—or who would like to understand the solution better—the easy computer will run a minitutorial that explains, in detail, the entire problem-solving process that took place.

In people's language

One of the most exciting features that identifies easy computing is powerful software that communicates in terms people understand. This type of software is best exemplified by the packages offered for LISA. Take LisaDraw, for example, an extremely complex graphics package that Apple promises will take only one-half hour to learn. By using the mouse as a paintbrush and pointing to any one of the palettes that are displayed on the screen, the LISA user can draw lines that are automatically straightened by the computer. He can also draw circles and rectangles and then add any of 36 different shadings for portions of the drawing, using 11 separate type styles. In addition, it's possible to cut and paste over the entire dimension of the graphic, which can be as many as 25 pages long, by simply pointing with the mouse to direct the movement of one part of the graph to another place on the diagram.

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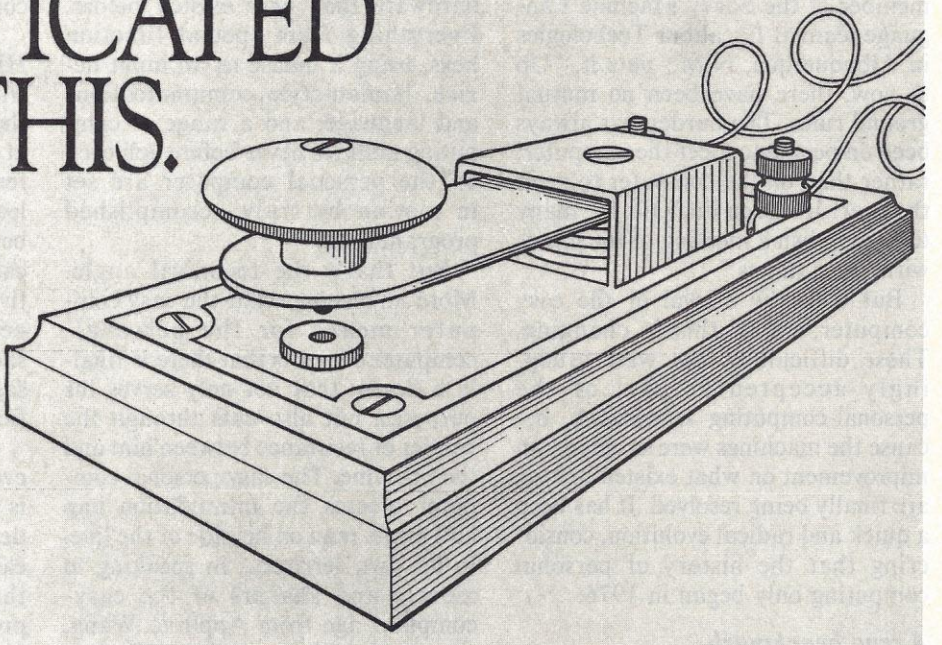

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The personal computer has taken the vast potential of computing power out of institutions and put it into the hands of individuals.

element of the easy computer is delineated: direct communication between the user and the computer in symbols and actions that a person can understand. The mouse becomes the drawing implement and is handled much like a pencil; the diagram is drawn by simply pointing to the picture on the computer screen that describes the necessary graphics action, from straight lines, to circles, to bar graphs, to pies.

But there's an additional piece to the software patchwork that has been created with the advent of easy computers. Not only are the individual or stand-alone software applications simplified, but much of the new software is so tightly integrated—or all-in-one, as it is called—that a user can also switch back and forth between computing functions with no difficulty. This was nearly impossible with the earlier generation of computers.

One of the strongest complaints about the first era of personal computers is that those who need to jump between many job functions, using similar files for each—such as making charts from spreadsheets and data bases or tying information from word-processor files into data-base managers—find it to be an exceedingly cumbersome chore. Often it requires juggling as many as eight or a dozen floppy disks—and sometimes even that bit of magic proves fruitless. But many of the new software packages born out of the easy-computer era are so significantly bundled together that simply pressing a button accomplishes these previously time-bound or impossible computing tasks.

For instance, the 1-2-3 business package for the IBM Personal Computer and the software written for LISA and the Wang Professional Computer allow the computer owner—by either using dedicated keyboard strokes or the LISA mouse—to go from one type of professional task to another with a single motion. And they let the user keep a central pool of information under his control that he can carry between these tasks. For example, he can use parts of his pool of data to create a five-year spreadsheet. Then, with only a few dedicated and uncomplicated keystrokes, he can use a portion of his spreadsheet for a pie chart while dumping another portion into his data-base manager.

This is a signal accomplishment of the easy-computer age, because it bypasses the need to switch constantly between software modules and to deal with new command codes for each business function. It allows the personal-computer owner to change gears on a given job without having to change disks or software.

Further signposts

This is just the tip of the iceberg. Additional signposts of the easy-computer era include the ability to speak to the computer as a user would talk to his product manager or secretary. For instance, the user can tell the computer to get everything that he sold in Cleveland from 1969 to 1976, and ask for the data in just those words. This is the ultimate promise of Savvy-type software. He can also separate instruction manuals that are written for the novice from those written for the advanced user. He will be able to use pages of text and huge columnar spreadsheets on the computer screen that simulate the paperwork he is more used to. And he will find simplified computer-installation directions, including diagrams, on the monitor that show how and where to hook up a new printer. The user will be able to use "undo" keys that allow him to take back more than a few previous computing actions when he changes his mind about something—the Corvus Concept, in particular, sports this feature. And so-called operating environments like VisiOn will permit the user to boot up and integrate two or more traditional stand-alone application software disks at a time, while "icons"—such as graphically drawn file drawers—will appear on software menus and vastly simplify the computer commands.

The testimonies of those who have worked in the trenches to bring the easy-computer age to its maturity bespeak a strong respect for the personal-computer owner and how he has provided the funds and the ground rules for the current marketplace. "All the influx of money made in the first few years of personal computing is the capital that the most far-reaching manufacturers used to go back to the drawing boards and develop these friendlier computers," says Winkless of Excalibur Technologies. "Despite the problems, the first harder-to-use machines were still so popular that they provided enough money to ensure the creation of the new generation of computers that people were saying they wanted. In a sense, the power of the marketplace wrested the personal-computing field from the overly technical influences it first had."

"The concept behind these new computers is simple," adds an industry observer who was involved with the earliest personal computers and also took part in the original discussions of LISA at Apple. "They want to build a computer that people can use without training, a computer that can provide self-documentation. They want to remove the intimidation factor that some of the old technology brought to its users and remove all the time and effort costs that went with that. And perhaps above all, they want to provide a computer that makes working with it a natural extension of the user's mental processes."

And that kind of talk is music to the ears of James Philbin and others who are convinced that they need personal computers to improve their lives, but who don't want to do battle with the inherent idiosyncrasies of machines to accomplish that.

A System That Pays For Itself

Computerizing a business' payroll can mean more than just turning a paper-laden manual system into a bookkeeper's dream—it also allows employers to carefully monitor salary levels and negotiate raises with more facts at their fingertips

by Theresa Engstrom

Maio Plumbing, Heating and Solar Inc. is one of those rare firms that is successfully battling the recession. While many companies in its field have capsized from rising energy and labor costs, and the weakened home-improvement market, the San Diego-based company grew by 15 percent last year. Maurice Maio, the firm's owner, gives a good deal of credit for that turn of events to the fact this his accounting procedures have recently been computerized. Simply by tightening some of the bookkeeping holes from which money leaked, Maio Plumbing has been able to stay afloat. And one of the chief areas of accounting improvement, Maio says, was in the often-overlooked payroll system.

"Getting control of your payroll," he says, "puts you in control of one of the least obvious, but potentially dangerous, drains of your revenues. For instance, one reason I made money last year is because I was able to cut down on excessive service costs. By having the computer generate a complete report that showed me how much each of my servicemen, who are paid on commission, were paid over a year's period, I was able to monitor my current outflow of cash to the servicemen and compare it with the past. With this information, I could decide if certain jobs were costing me too much to take on, and not worth it to me. Overall, I was able to keep the outflow in check."

Payroll programs are playing an increasingly important role in the success or failure of small companies. With overall labor costs skyrocketing—including base wages, taxes, insurance, and additional compensation—many employers find that they are staying in business merely to pay salaries. Personal-computer payroll programs cannot do anything about inflation and yearly employee wage-increase requests, but they can give an employer a true picture of his salary structure and help him generate reports that allow him to analyze where he could save money through better management of his human resources. In addition, the payroll packages prove economical because they sharply reduce the time the employer or his bookkeeper spend actually preparing the payroll—calculating the number of hours worked, multiplying the hours against the pay scale, adding overtime or commissions, deducting taxes, and printing checks. This could represent a sizable savings when you realize it's considered that for some businesses, just working on the weekly payroll accounts for nearly 25 percent of the overhead.

The rosy state of Maio Plumbing is a fairly recent condition. The small firm has come a long way since 1975, when Maurice's father died and left him the company. At that time Maio Plumbing had one employee—19-year-old Maurice himself—and one truck. In those days, Maio remembers, he paid the bills out of his personal checkbook and concentrated on building the company while ignoring the paperwork.

Buried in paper

But by mid-1982 Maio finally looked up to discover that his business was buried in paper, most of it emanating from its accounting procedures. The company had grown tremendously, from one employee to 25 in seven years, and was running 15 trucks instead of one. Revenues had jumped 75 percent in 1979 alone and about 50 percent in 1980. But with this growth came other signs which made it clear that Maio had outgrown his manual paperweighted bookkeeping system.

"We had no control over our accounts payable, payroll, or accounts receivable," Maio says. "We didn't know who owed us what or what we owed anymore. When you have as

Theresa Engstrom, former editor of the New England Business *magazine, is a writer from Sharon, Mass.*

Illustration by Dave Pauley

Working on the weekly payroll, a chore that used to require nearly a day, now takes less than an hour.

much paper as we had, you're bound to lose track of some things." For instance, Maio says, plumbers rely on percentage discounts given them by suppliers for early payments to make up a portion of materials costs. "We were losing all of these discounts, because our cash flow was operating without any monitoring."

Payroll a hodgepodge

And Maio's payroll was getting just as complicated. All the employee and salary-payment information was kept in a hodgepodge on various pads and ledger notebooks, each getting messier and more unintelligible with the passing weeks. Things got so bad that he almost lost the employee who handled the payroll. "She couldn't take all the paperwork after a while—and how fast it poured in," he says of 19-year-old Theresa McCann. "It took her about seven hours a week to do the payroll and many more just to keep up with answering the questions that arose from the payroll." So while his suppliers and customers had not yet caught on to "how screwed up we were inside," Maio says, his employees were beginning to see the disaster first-hand. He decided then that it was time to whip the business into shape.

Maio's attorney advised him to consider purchasing a personal computer with an accounting-software package. Then he met with other small businessmen who had recently purchased such systems. He liked what he saw, especially in the area of improved efficiency, and decided to buy an Altos computer with the Accounting Plus package from Systems Plus (Palo Alto, Calif.).

"The software," Maio says, "very clearly met our needs. We wanted an integrated package that could combine accounts receivable, accounts payable, payroll, and general ledger in one package. This means that as we add a new figure to any one of these parts of the software, all of the other modules, including general led-

WHEN YOU SHOP FOR PAYROLL SOFTWARE

Most businessmen are not accountants by profession, which makes the task of shopping for a good payroll program a bit sticky. How does one tell the hard sell from the software?

We asked James R. Zafarana, managing partner of the Boston accounting firm Zafarana, Macdonald & Savy, to describe how one should go about choosing a payroll program, and some of the most interesting features available. Since Zafarana is in the process of helping develop custom accounting software for his firm's IBM Personal Computer, he's given these issues a lot of thought.

ONE: Will it do what I want it to do? Although that may sound like a facile question, Zafarana says that too many small businessmen buy programs that are really ill-suited to their needs. He recommends that you go to the computer store with a list of the types of compensation that you want the payroll program to handle, and break them down into their most minute categories. Then, Zafarana says, make sure that the software can handle them all.

TWO: Is the program reliable? The best way to test this is to quiz other users of the software. Ask them if the program accurately recognizes and flags problems, and whether it has built-in checks against illogical bookkeeping procedures. Zafarana gives this example: One of his client's employees borrowed a sum of money from the company, to be paid back out of his commission earnings at a set amount each week. When the employee came up with a short week and had insufficient net pay to cover the loan payback, the software that Zafarana's client used could not recognize a negative paycheck sum. Instead, it added the number as a positive to a long column of compensation figures, throwing the firm's payroll out of kilter for months.

THREE: Is it able to generate reports on accumulated sick pay, vacation days, and holidays, with their appropriate taxes? This is important for many people, Zafarana says, especially considering the new law that requires disclosure of vacation time to employees.

FOUR: Does the program allocate payroll expenses to predetermined cost centers? This is an especially useful function for a businessman who is running more than one operation at a time.

FIVE: Is the software able to keep a record of accumulated earnings to date by employee, and is it able to subtotal on quarterly and year-to-date bases? "Payroll tax returns are prepared on a quarterly basis," says Zafarana. "This kind of program can virtually prepare your tax returns for you." Moreover, larger companies may want to allot their taxes immediately after each payroll process, Zafarana suggests.

SIX: As a hedge against embezzlement, does the program make it difficult to get a terminated employee back on the payroll? Zafarana says that many packages allow the social-security numbers of fired employees to be flagged. This way the computer will refuse to print a paycheck for that person without special clearance.

SEVEN: Does the program contain a feature that allows you to list a predetermined maximum amount for any given paycheck? This simple checkpoint prevents any mistakes like a $10,000 weekly paycheck from occurring in your business.

EIGHT: Is the program easy to learn? Is the language included in the documentation simple or unintelligible? Is there a demonstration disk?

Zafarana emphasizes that some of these features may be accounting overkill in certain small businesses. An employer should consider which features are vital to his particular company and which ones are not worth the extra expense. This refers us back to the first point: Know your business, and buy your software based specifically on its needs.

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CIRCLE 38

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ger, are updated to reflect this new debit or asset. Accounting Plus has this feature. Also, I wanted a package with a reputation for good documentation. This system, according to our examination, had a proven record along these lines."

It took about two months for Maio to become acclimated to Accounting Plus and the Altos computer. During that time he slowly taught himself the software, using the written documentation and demonstration disks. The learning process, Maio says, was made easier because the software had an interesting tutorial twist. It invited the new user to make believe he owned an imaginary company—a bicycle company—and then it took him through the process of setting up an accounting system for this firm. "The way I did it was, I toyed around with working out a decent payroll system for the bicycle firm," Maio says. "And when I felt comfortable that this system was what I wanted—and when I was sure that it worked for the bicycle company—I applied the model to real life, to my own company."

When he was ready to use the payroll package, Maio categorized his 25 employees into three separate compensation groups, differentiating between whether they are paid weekly, hourly, or by commission. He made these categories the central employee divisions of the payroll software. Then Maio keyboarded each worker's name, address, social security number, job classification, and rate of pay into the appropriate division. He also input the California and federal tax tables.

From a day to less than an hour

"That was the entire setting-up process for our payroll," he says. "It took us a total of about six hours. And with that employee information in the computer, we are able to produce a weekly check for our salaried workers by simply pressing a print key, because no additional information is needed for the computer to process their pay. For hourly workers we type in how many hours they worked during that week, and then press the print key to get a check made. And for our commission workers we type in the gross sum of money that the commission is to be based on—the computer already knows the commission percentage—and then press the print key." Working on the weekly payroll, a chore that used to require nearly a day, now takes less than an hour, Maio says.

Beyond the obvious improvement in the amount of time it takes to process the payroll, the computer and software show their worth in their ability to generate a slew of reports. Almost any portion of the employee payroll system, from vacation days left over to miscellaneous seasonal deductions, can be seen after a few keyboard strokes. For instance, Maio monitors the number of hours and dollars spent on specific service calls—and how well those calls were handled—by printing out a report that lists job payment and job speed. He can then gauge this information against job quality, which he keeps track of on separate paper files. He also keeps a running tab on his outflow of payroll taxes.

Perhaps the most important fringe benefit of the computerized payroll program, Maio says, is that it lets him deal with his employees more effectively and fairly when yearly tugs of war over salary increases occur.

Intelligent negotiations

"When it comes time to negotiate pay with an employee," he says, "I simply print out a record of his salary or commissions history covering his time at the company, and have it in front of me. This way I can negotiate intelligently, taking into account his history of pay hikes, commission returns, and other portions of his employment record. This sort of report would be time consuming to do manually, and that kept me from going that approach before."

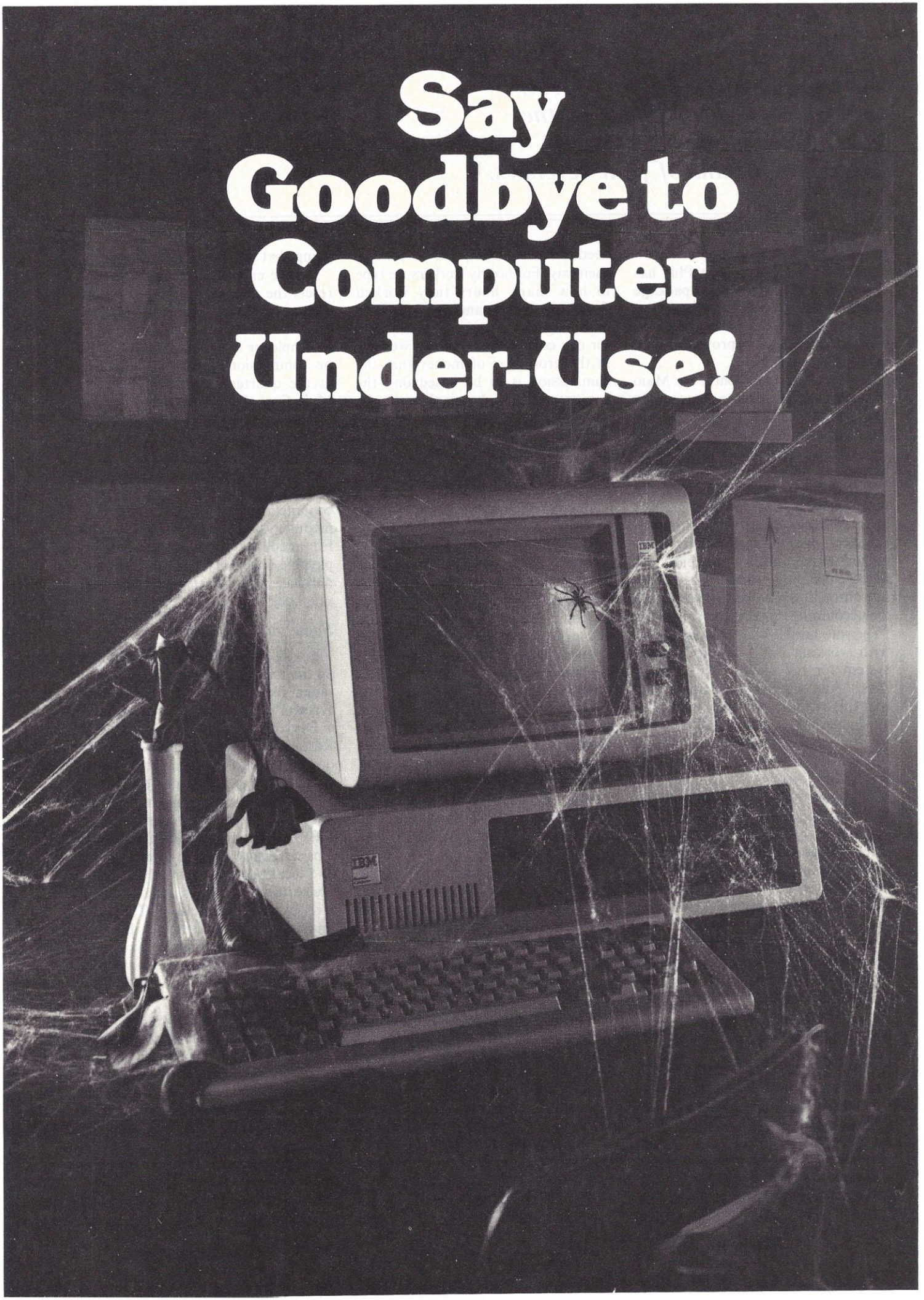
At the end of each quarter, Maio resets the payroll program to a zero balance and saves the employee information built up over that period. If an employee's pay rate is changed or his commission structure is adjusted, at the quarterly program clean-out Maio fixes the new figures in four to five minutes.

The Accounting Plus package is composed of eight interactive modules that retail for $500 to $700 each. The payroll program works only in conjunction with the general-ledger module. Also available are modules for accounts receivable, accounts payable, inventory, sales order entry, purchase order entry, and point-of-sale bookkeeping.

Some other choices

Many of the newer payroll packages on the market are responding to customer requests for more specialized types of transactions. For instance:

- Payroll, from Broderbund (San Rafael, Calif.), is a program that operates as a non-interactive, stand-alone package. It divides employees into 15 separate common-payment and employment categories.
- BPI Systems (Austin, Texas) has a payroll package with federal, state, and local tax tables already listed in the software, which is updated regularly by the manufacturer. This is an important accomplishment, because getting the government tax codes onto new accounting software can often require an accomplished accountant.
- The Basic Accounting System, from Hayden Software (Lowell, Mass.), is touted as operating in the same manner as a manual system. This means that, unlike most other payroll packages, the processing of each employee's pay is completed before the next employee is processed by the system. It is felt that because this is akin to the way most bookkeepers are used to doing the payroll, it's an easier system to master.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CIRCLE 28

Striking Back At Technological Terror

Computerphobia often hits many managers just when they realize they need the machine to survive in business. An antidote—the hands-on training session—has become the most common treatment for this condition

by Jeffrey Rothfeder, Associate Editor

It was an incongruous group of business managers who gathered at the Howard Johnson Motor Hotel outside New York City on a Thursday morning in late October. Drawn there by a hands-on personal computing seminar, they sat somewhat nervously, lined up at Apple computers. They listened intently to the trainer's instructions, like test-takers heeding a proctor on SAT day. Included were representatives of Fortune 500 firms—General Electric, RCA, Chase Manhattan Bank—and some representatives of companies that were preoccupied with simply reaching $500,000 in sales, like The Jersey Tab Card Corporation and Jackson Chemicals of Rhode Island. By corporate standards, this was an unlikely and diverse group covering a broad range of financial conditions.

Still, they had one concern in common. Information anarchy had grown up around them at their firms; individually, the managers had decided to give the personal computer a shot at their problems. But like many other executives, they found that a side effect of their need to computerize was a case of computerphobia. They suffered from an ingrained fear of the machine and a fear that by attempting to use a personal computer they were treading into technological territory that would be overwhelming.

Robert Musho, the reliability and maintainability administrator at GE Aircraft in Lynn, Mass., is a case in point. Over the last two years he watched the job of keeping monthly performance records on the firm's military airplane engines grow in scope, until doing it manually crossed the barrier from being difficult to downright inefficient. Badly in need of a solution, he decided that the personal computer would enable him to record the engine data and possibly forecast future aircraft capabilities. But as it became more and more a fait accompli that he would purchase a personal computer, the fears came—in droves.

"I pictured myself with the machine set up and ready to go, and suddenly I got the feeling, 'Suppose I pressed the wrong button—what will happen?'" says Musho. "Will I lose all my information? Will I muck the whole system up dangerously? Hardware suppliers and computer retailers never seem to have the patience to provide satisfactory answers to these questions."

So, to find some answers, he attended the computer-training seminar near New York City. The result, according to Musho: "Working with the machine while a teacher watched how I used the computer convinced me that there was very little that I could do to the personal computer that would be a complete disaster."

The thought of turning over their most important corporate tasks—be it bookkeeping, spreadsheeting, database management, or the like—to the personal computer, a machine that inhabits a mysterious world of control keys, menus, and cursor movements, is—to many executives—a frightening one.

The technological tyro

"Most of the time the small businessman or the individual corporate manager who wants a personal computer is a technological tyro," says William Flynn, a management consultant in New Canaan, Conn. "The obvious place for him to get information about the computer he may want to buy would be the computer store. But he's grown afraid to go to computer stores with hardware or software questions, because these outlets are usually manned by either dyed-in-the-wool technical types who talk over his head or by salesmen who know too little about the internal workings of businesses to answer him. To the manager, there are a tremendous number of unknowns and a tremendous array of phobias tied into buying or using a personal computer for the first time."

Flynn adds that chronically confusing hardware and software instruction manuals only add to the

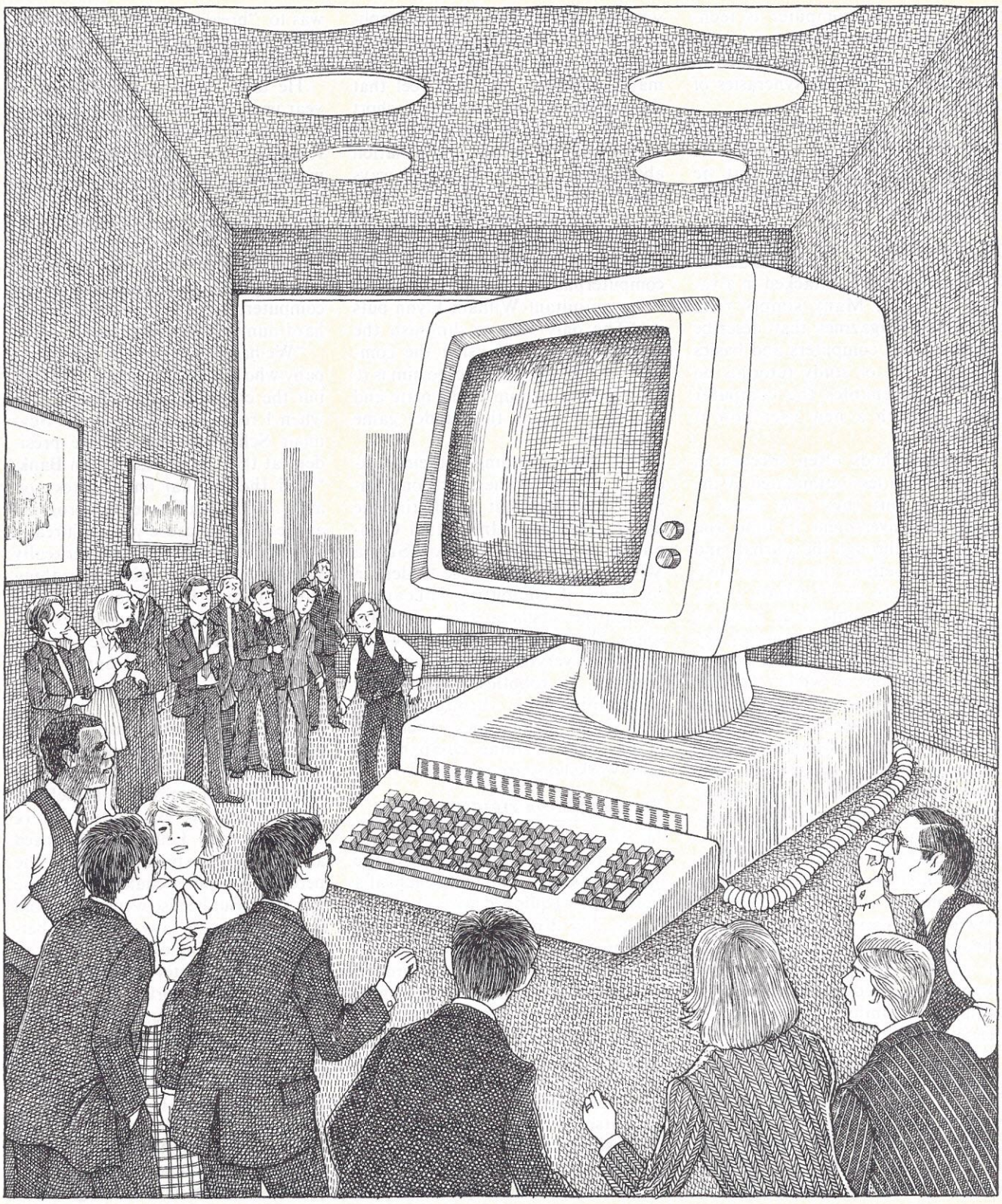


illustration by Allen Say

"The executive is used to being the kingpin in his business, but he doesn't feel like that at first, in front of his computer."

feeling that the computer is technologically beyond the ken of most businessmen who are not attuned to the buzzwords and idiosyncrasies of computing.

"To put it simply," Flynn says, "the executive is used to being the kingpin in his business, but he doesn't feel like that in front of his computer."

The antidotes

Computerphobia is attacked in a variety of ways. Many simply read books and magazines that describe the innards of computers and basics of computing, or study tutorials on disk, which enables the computer itself to teach a new user how it operates.

These methods often succeed in making a user less intimidated by the computer, but they also exact a significant investment in time and effort to get through the journals and lessons—something that a lot of business managers can't afford. Also, these methods sometimes raise as many questions as they answer, because all of the information is learned in solo situations in which the user cannot bring up additional questions or have face-to-face feedback on issues. So for more dramatic results, the most common way used to overcome computerphobia is the hands-on training session, away from the office, like the one Musho praised.

The computer-training workshop, mainly because of computerphobia, is becoming one of the fastest-growing businesses in the country. Though currently still an industry in its infancy, some high-technology consultants predict that by 1986 computer training directed at the neophyte will be a $3 billion market.

Computer stores have not let this trend go unnoticed. Realizing that fear of the machine could make a resistant buyer considerably more demure, many retailers are offering what they term "computerphobia killers"—basic one-hour training sessions, usually on a specific application like spreadsheeting, word processing, or programming. But many corporate managers feel that these types of sessions are too short and, thus, lack the depth they need to translate classroom information about the machine into actual ways to use it back at the home office. For them, the intensive two-day (or more) study session is a much better approach to rid themselves of computerphobia.

As consultant William Flynn puts it: "The only way to diminish the individual's fear of using the computer and how it will react to him is to force him to step up to the plate and face it for a long time under game conditions."

And that, according to their backers, is the goal of the hands-on computer workshops that are dotting the nation these days. Integrated Computer Systems (ICS) of Santa Monica, Calif., one of the leaders in the field of computing education, offered the session at Howard Johnson's. The firm also presents workshops on everything from computer graphics, to robotics, to computer communications, throughout the year in all major cities. There are many other training companies—ICS' workshops are typical.

Breaking down rigidity

The training session held at Howard Johnson's was set up with each of the managers seated, two to a bench, at a workstation equipped with an Apple II, one disk drive, and a printer able to reproduce graphics. Over the two days the students were taken through the uses of the VisiCalc spreadsheet as well as its companion software, VisiPlot and VisiTrend, two graphics packages. Moreover, they were given an inkling of what programming and electronic mail are about.

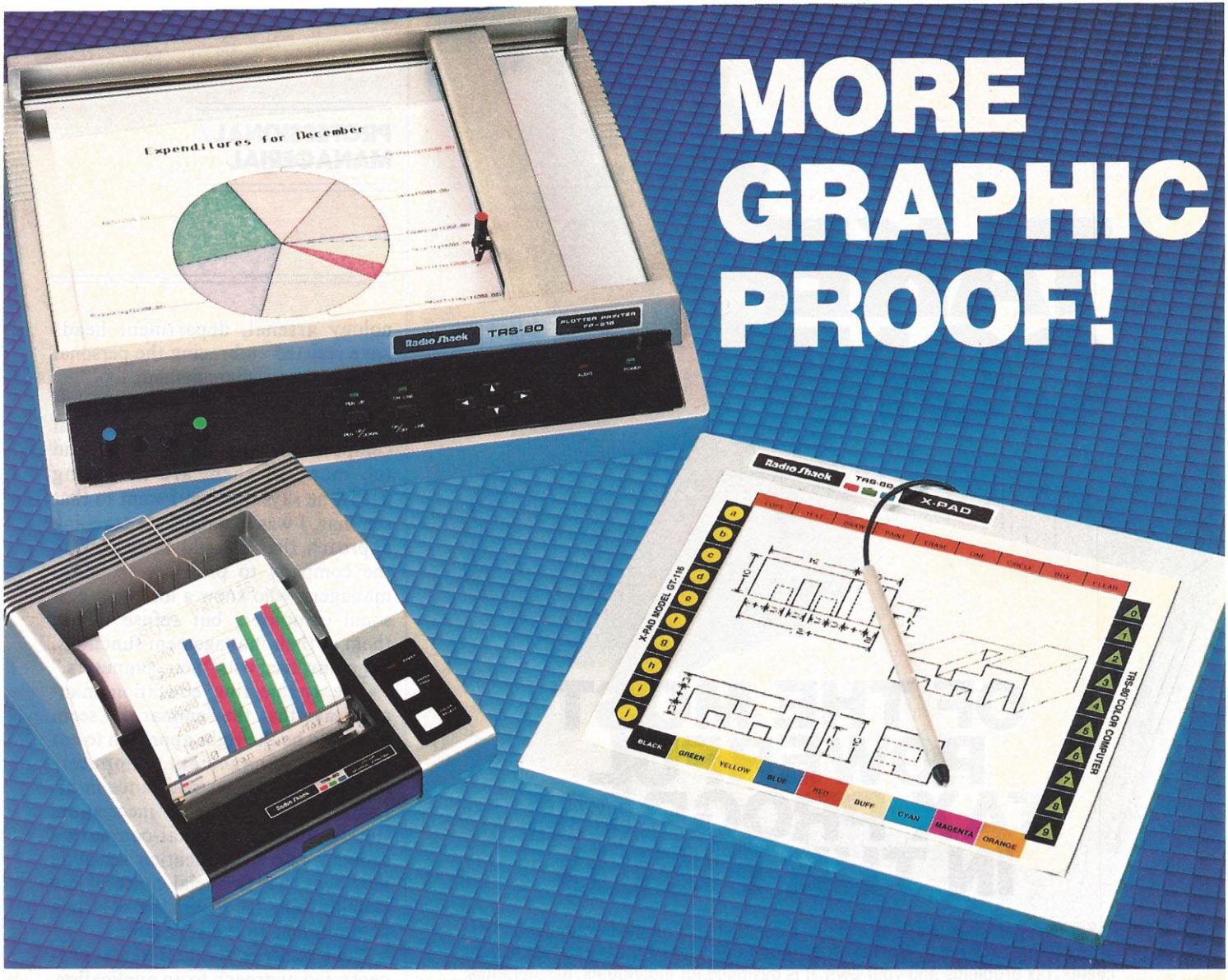
Course instructor Dick Heiser ran increasingly sophisticated financial transactions on the VisiCalc software. He says his express purpose was to "break down rigidity and the fear of movement that accompanies the first computer experience."

He took the attendees through a year in the life of a hypothetical corporation, separating its financial information into categories of sales, materials, labor and overhead costs, revenues, and net profit. By the end of the two days the managers had jiggered and rejiggered this imaginary firm's figures by spreadsheeting, trending, and forecasting them on the computer, then getting results in both hard numbers and pictures.

"We have other people in our company who are already using VisiCalc, but the closest I got to using it was when I read the manual," says Seymour Schonfeld, second vice president at the Chase Manhattan Bank. "And the manual only scares you away. It's difficult to learn a program at the office, because you don't really have the time, and you're never really sure that you're getting everything out of it from the manual. The seminar was a complete learning experience. It gave me a chance to work with the computer in an unpressured environment."

Schonfeld came to the workshop hoping to find a way to use his Apple personal computer to reproduce and update floor plans for the financial giant's mainframe rooms. He left realizing that his expectations were somewhat high. Unless he purchased an extremely expensive system, the personal computer could not fit these purposes. But he also went away from the workshop, he says, with a far better understanding of the work he can expect the computer to do and how to make it do that work.

Another executive, the manager of engineering education at a major electronics firm, came to the seminar to help direct an attack on the computerphobia that has grown at his company. Ironically, while the engineers at his corporation design some of the most sophisticated components in the national high-tech-



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CIRCLE 30

nology arsenal, department heads have resisted embracing the personal computer as a management tool.

"Call it fear of the unknown, but there are an awful lot of personal computers around this company, and too many of them are not being used," he says. "When I went to that seminar, I was looking for a teaching approach that I could take back to the company to prod my technical managers, who know a lot about personal computers but refuse to use them in their management functions, to get involved with their computers."

The engineering education manager says that the seminar did seem to him to be the right approach to cut through management computerphobia or computer resistance in his firm. He would like to incorporate the hands-on, personal-computing seminar into his education schedule next year, but financial concerns are keeping him from making a strong commitment to the program.

"The seminar was an intense, concentrated approach to an application, spreadsheeting, that is crucial to daily management life," he says. "The nice thing about bringing a seminar like that in-house is that the manager can learn about the computer and then take his new knowledge back to his desk and begin working with it immediately. He will have overcome his fear of the computer and learned how to use it correctly at the same time."

The underlying message appears to be that, over the past five years, personal-computer use has grown significantly as a powerful tool. It has also left a full measure of its potential owners wrestling with fears about the machine and the way it works. Perhaps the announcement of the LISA computer from Apple, as well as the introduction of other so-called "friendly" machines recently, signify a new wave in personal computing that will move the need for hands-on, computerphobia training workshops off the front burners.

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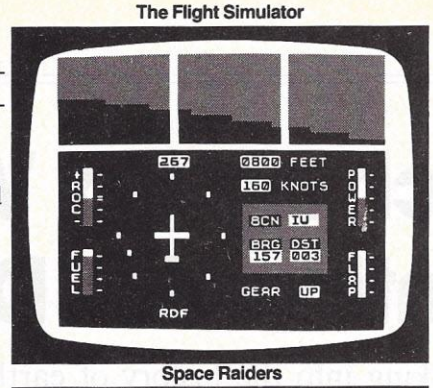

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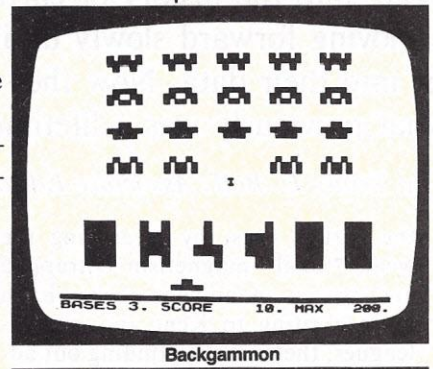

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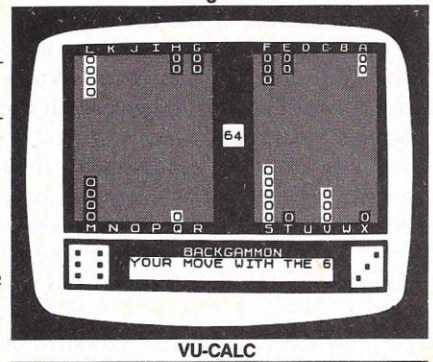

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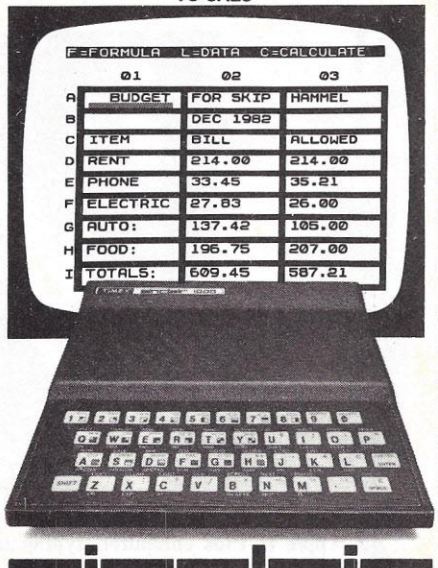

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Catching Up With Continental Drift

Geophysicists looking into the history of earth in order to plot the future were moving forward slowly until they hooked a personal computer into their data. Now they are able to do in months what previously was a lifetime of work

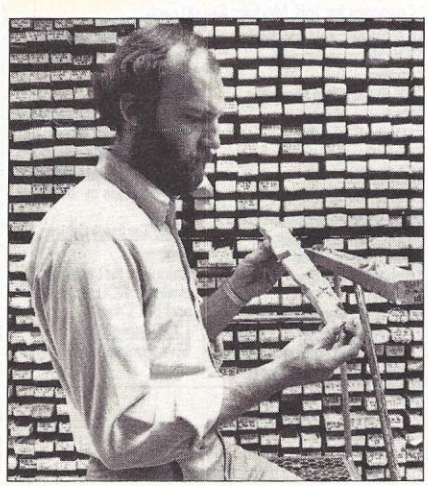
by Trudy E. Bell, Associate Editor

Did you know that 200 million years ago, when dinosaurs still stalked the earth, that what is now New York City was then the tropics? Did you know that 200 million years from now New York City may have drifted into the Arctic and be slowly uplifting, perhaps accompanied by earthquakes and volcanoes? The majestic forces of continental drift may seem remote from everyday life, but they have fascinated geologist Dennis V. Kent for years.

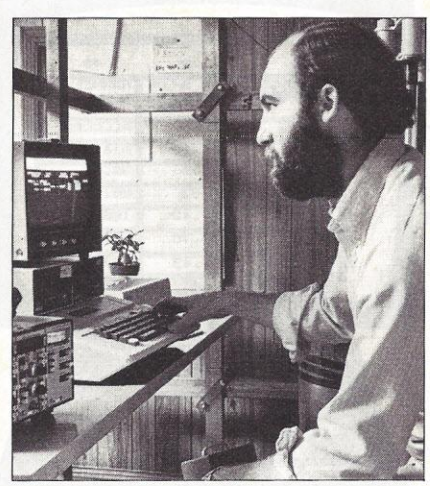
For much of his career, Kent, along with several co-workers at Lamont-Doherty Geological Observatory, has traced the movement of the earth's crust by measuring the weak "fossil" magnetism entrapped and frozen in ancient rocks. Even more exciting to Kent and his colleagues, they are now finding out additional secrets of the earth's past—more than they had dreamed possible—all because of an Apple computer. Their experience with the personal computer—which acts essentially as a data processor for their measuring device—is a window onto how personal computers can be applied to facilitate a wide range of complex and detailed applications.

Kent's laboratory is in a low, concrete, wooden, converted cowshed on the old Lamont estate, nestled in the trees high on the ancient basaltic columns of Palisades, N.Y. Inside the laboratory, in one corner, is his four-foot-high cylindrical measuring instrument, which looks like a stocky, aluminum water heater: a cryogenic magnetometer, an instrument sensitive enough to detect magnetism one-millionth the intensity of the earth's magnetic field—one-billionth the strength of an ordinary toy bar magnet.

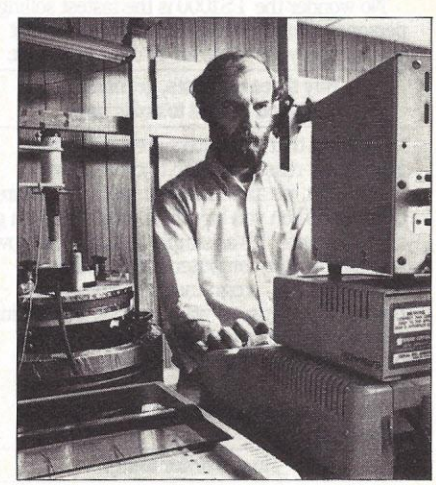
The tall, bearded Kent carefully attaches a chunk of ancient ocean sediment to the teeth of a plastic gripper at the end of a three-foot-long



1 Geologist Dennis V. Kent examines a section of a core of ocean sediments—one of 17,000 at Lamont-Doherty Geological Observatory.



2 Kent sits before the keyboard of his Apple II Plus computer, typing in data about the rock sample whose magnetic field is to be measured.



3 Standing at Kent's right is the instrument for measuring each rock sample's magnetic field—the sensitive cryogenic magnetometer.

plastic tube. Slowly he extends the rock sample deep into the supercooled chamber of the magnetometer. After carefully orienting the sample within the instrument by turning a handle at the top of the cylinder, he presses a button. Immediately the Apple II personal computer next to him records the sample's identification number as well as the direction and orientation of its weak magnetic field.

"Adding the Apple personal computer has dramatically increased the efficiency of our measurements," Kent remarks, waving a lean hand toward the computer printout. "With the combination of the cryogenic magnetometer and the Apple II, we can now do in a month what used to take nearly half a year. We can dare to make measurements in more detail than we would have even attempted before—and more cost-effectively. And we also have more freedom to experiment with new ideas."

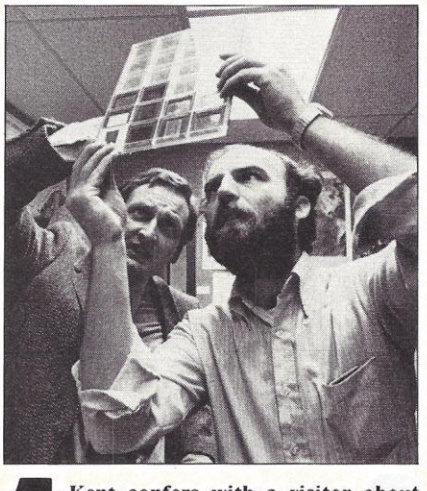
The mission of Kent and his colleagues—to learn more about the evolution of this planet by tracing the variations in the earth's magnetic field back half a billion years into the geologic past, and perhaps even to shed a little additional insight into the co-evolutionary magnetic history of the moon and other planets of the solar system—may now be attainable.

The earth's magnetic memory

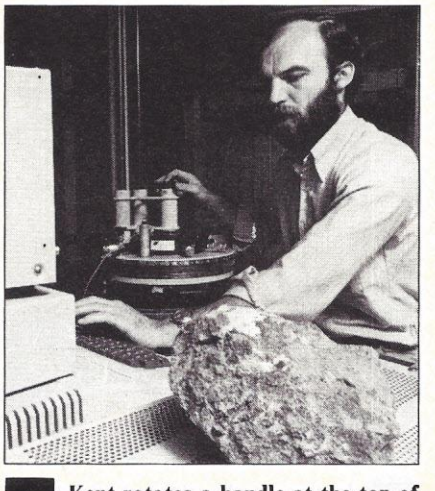
The magnetic field of the earth is far from constant. Over a period of centuries the intensity of the magnetic field at any one location fluctuates, as does the local orientation of magnetic north with respect to geographic north. For example, whereas today, from Boston, a compass needle would be deflected 15 degrees west of geographic north, in 1780—only 200 years ago—magnetic north in Boston was almost due geographic north. Every few hundred thousand years the polarity of the magnetic field has flipped over completely, so that what is now the north magnetic pole was once the south. For reasons that still elude geologists, the magnetic field has reversed itself at irregular intervals dozens of times over the earth's past. And over millions of years, the slow drifting of the continents over the earth's molten interior has made the direction of the magnetic pole appear to wander. For example, since the Triassic period 200 million years ago, what is now New York City has drifted 2000 miles north, from the tropics to its present latitude of plus 40 degrees.

The history of the earth's changing magnetic field is locked within the rocks of the earth's crust. Most rocks contain some form of iron or other magnetic material. Lava flowing from volcanoes becomes magnetized by the presence of the earth's magnetic field. When the lava cools and solidifies, the orientation of the earth's magnetic field at the time of the eruption is frozen into place. Similarly, fine particles of sediment that drift down through lakes or through the ocean are weakly oriented by the earth's magnetic field. When the particles land on the bottom of the lake or ocean, they, too, preserve a record of the earth's magnetic past at the time they were deposited.

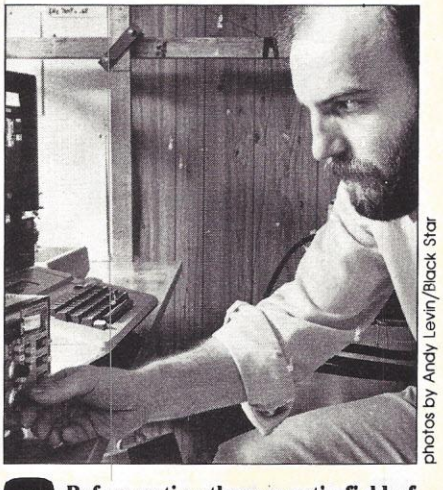
In the quest to uncover the earth's ancient magnetic past—the quest known as paleomagnetism—Kent and his colleagues at Lamont-Doherty have sailed into the Atlantic either aboard their own research vessel or aboard the Glomar Challenger. They have drilled deep into ocean beds and extracted cores of ancient sedimentary rocks. In similar quests, cores have been drilled in even more



4 Kent confers with a visitor about other geological research, closely examining slides prepared for presentation at a symposium.



5 Kent rotates a handle at the top of the magnetometer to position the rock sample (from West Africa) inside for measurement.



6 Before noting the magnetic field of each sample, Kent moves the output controls of the empty magnetometer, calibrating the sensor to zero.

photos by Andy Levin/Black Star

"Adding the personal computer made the process of recording the data equal to the efficiency of the magnetometer in measuring it."

ancient lava fields and sediments in eastern North America, China, and West Africa, and they have been chipped out of younger rocks exposed on land in Pakistan. Because in all cases the upper layers of the lava and sediments were laid down more recently than the deeper layers, the magnetic memory preserved from different depths reveals the changing history of the earth's magnetic field—literally a magnetic core memory of the earth through time.

The magnetic secrets locked within the older rocks provide clues to the drift of the continents over the earth's surface over millions of years. These older rocks are also valuable for dating the irregular pattern of the reversals of the earth's magnetic field. Because the pattern of geomagnetic reversals provides a measure as characteristic of the rocks as the growth rings provide in trees, knowledge of the reversals can be used to help identify the ages of the younger sediments from the oceans and land to a precision better than several thousand years.

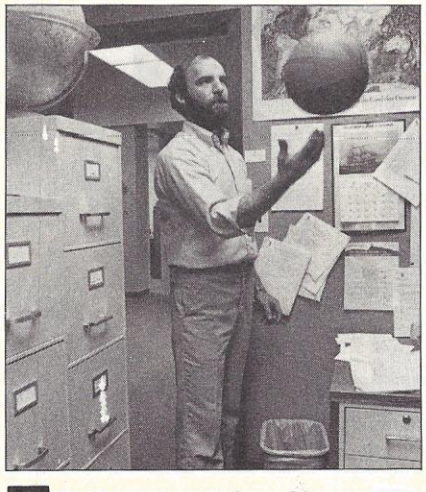
Something old, something new

As the rock cores and samples are extracted from the ground, Kent carefully records the latitude, longitude, and local orientation of each core. After the cores are transported back to the laboratory, he slices them into samples measuring an inch or two on a side. Each sample is prepared for measurement by being given a unique identifying code number or name. In addition, each sample is scored with a stylus to indicate its orientation within the core with respect to a simple x,y,z coordinate system. After the sample is prepared that way, its weak, preserved magnetic field is then measured by means of a cryogenic magnetometer.

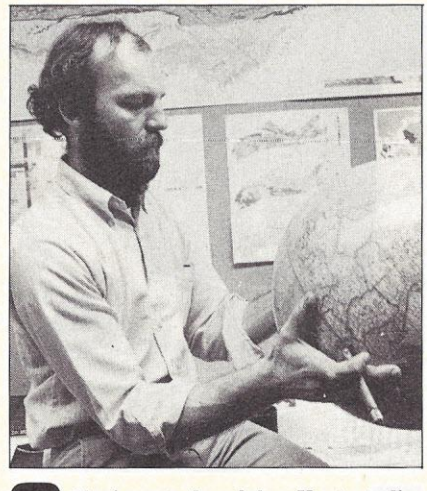
Magnetometer measurement of rocks is not a new type of research. The technique dates back to the 1940s, and the Lamont-Doherty Geological Observatory has had geologists interested in this type of research since the 1960s. A bottleneck to the old techniques, however, was the painstakingly tedious process of recording the data from each sample. The earliest technique for measuring the magnetic fields of rocks used an analog voltmeter, which has a dial that displays values proportional to the sample's residual magnetism. A technician read the dial for each orientation of the sample and manually recorded the values on a coding sheet—a process that required several minutes per measurement. Later, the information from the coding sheets was keypunched onto computer cards, which were then loaded into Lamont-Doherty's central computer for analysis. "Every step of the way there was the possibility of transcribing errors," Kent recalls. "Recording the information became the slowest part of the procedure."

The situation improved somewhat around 1970 when Kent and his colleagues received a British spinner magnetometer, which was interfaced to a small Digico Micro 16V computer. The spinner magnetometer works by spinning the sample at seven rotations per second. The spinning, magnetized sample creates an electric current proportional to the amount of magnetism. The current is measured, and its value is recorded by means of punched paper tape and a teletype. Weakly magnetized samples set up only a very weak current, however, so the measurements must be integrated in the computer's memory over a long time to yield any kind of valid measurement with decent reliability. For very weak sam-

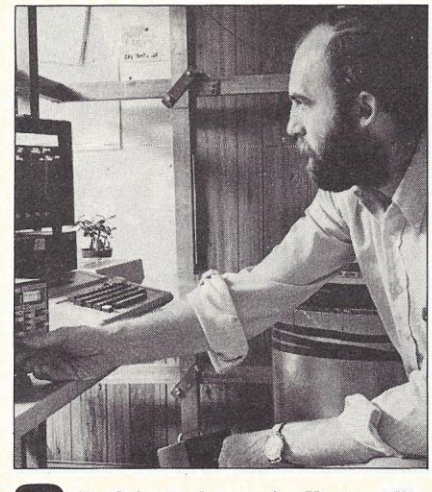
(continued on page 74)



7 **Taking a break from his measurements, Kent tosses a basketball in his office to warm up for the Lamont-Doherty basketball practice.**



8 **Gazing at the globe, Kent studies the coastline of West Africa and the shape of the Atlantic Ocean, widened by continental drift.**



9 **Back in the lab again, Kent readies the magnetometer and the personal computer to resume their work of tracing the earth's magnetic past.**

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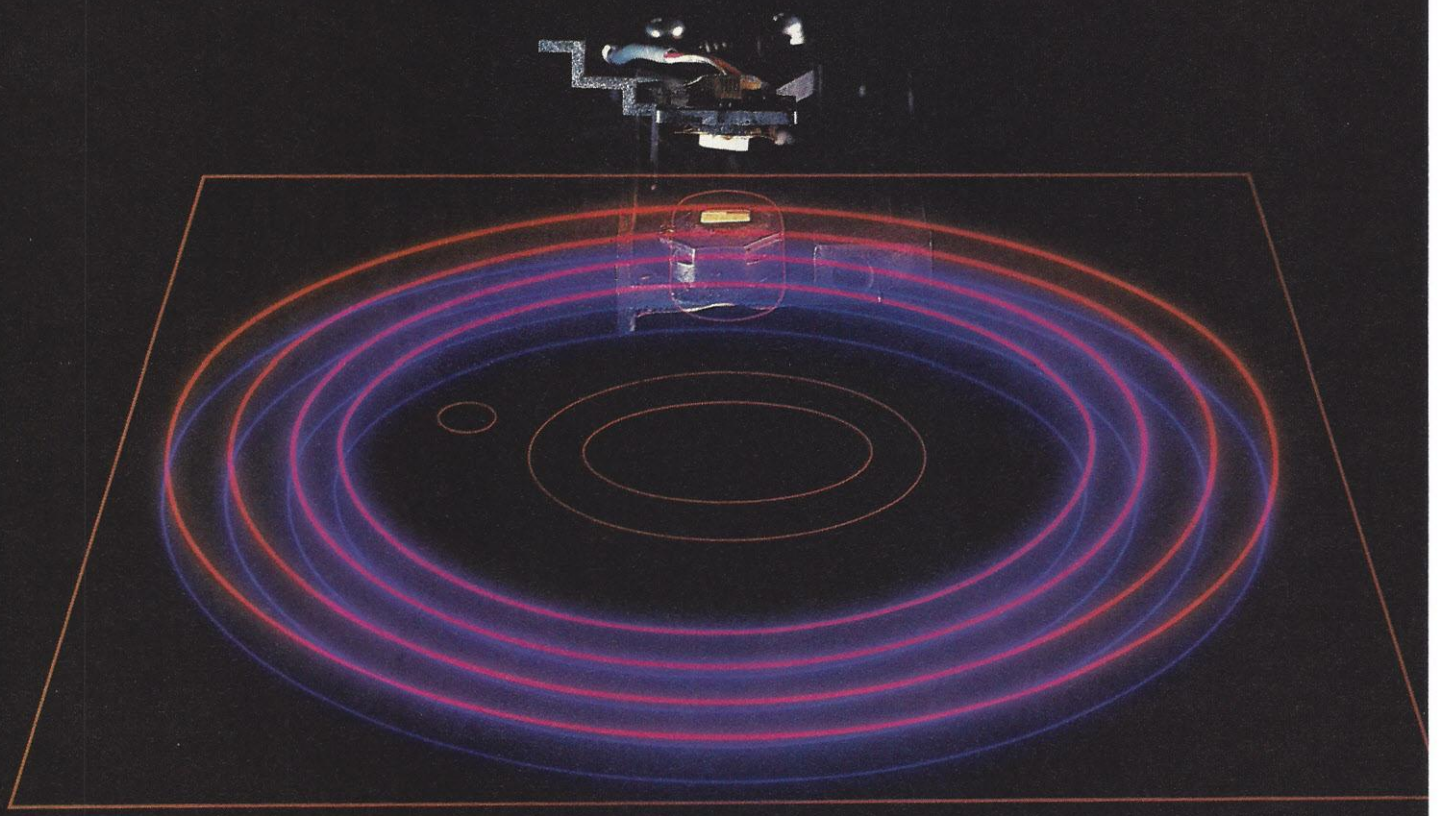

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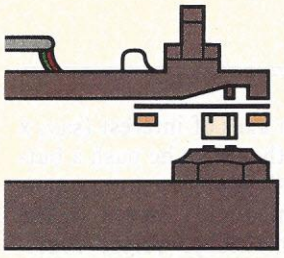

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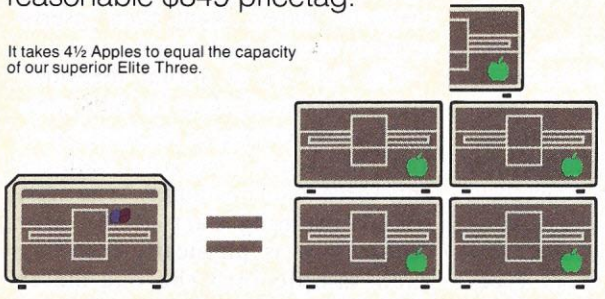

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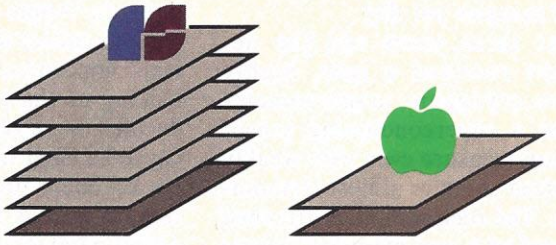

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CONTINENTAL DRIFT

(continued from page 70)

ples, the integration time can run to 30 or 40 seconds per measurement. With six pairs of measurements required along different axes for each sample, the time required to orient, sense, integrate, and record the information can take upward of 10 to 15 minutes—working out to perhaps only 30 samples per day.

About three years ago the department received a new, highly sensitive cryogenic magnetometer that has a superconducting sensor which can measure even very weakly magnetized samples almost instantaneously. The rock sample is attached to the end of a non-magnetic plastic probe and lowered through a room-temperature port into the center of the device. The heart of the instrument is a niobium sensor, cooled to 4 degrees Kelvin (minus 450 degrees Farenheit) by liquid helium—a temperature so low that the niobium loses virtually all its electrical resistance and becomes a superconductor. The movement of the slightly magnetic rock sample instantly sets up a small, direct current in the niobium sensor, which persists because there is no electrical resistance to damp it. Measuring the magnitude of the persistent current reveals the magnitude of the magnetic field through two axes of the sample.

Although the actual sensor and electronics at the center of the magnetometer would measure less than a foot on a side, the bulk of the large instrument is an evacuated Dewar flask (Thermos bottle). This both insulates the frigid, liquid helium from the warmth of the air in the laboratory and shields the niobium sensor from the magnetic field of the earth.

With the advent of such a sensitive, responsive instrument, it became clear to Kent that to maximize the instrument's capabilities, neither recording the data by hand nor recording it with the 10-year-old Digico computer that uses paper tape and a teletype would suffice. Kent began exploring the possibility of interfacing the new cryogenic magnetometer with a personal computer.

Enter the Apple

Kent was inspired to get a personal computer by witnessing the success of a colleague in the neighboring geochemistry department who was using both an Apple and a Commodore PET to collect data about the chemical composition of rocks and soils. In looking at the two computers, Kent decided on an Apple II, primarily because he liked the particular setup of its keyboard for entering information, as well as the larger number of access ports for interfacing it with the magnetometer.

Oddly enough, the manufacturer of the cryogenic magnetometer did not design the instrument with any form of computer access. "We had to hire someone to go inside the magnetometer and hard-wire it with the Apple," Kent recalls.

With the Apple now on line, however, each sample is measured as follows: Before beginning a measurement, Kent enters the information about the core yielding the sample into the computer's memory, along with all the necessary parameters of latitude, longitude, and local orientation. Next, Kent types the sample's unique identifying name into the computer's memory, plus whatever treatment the sample may have undergone to isolate certain of its magnetic properties.

After the information is entered, Kent records a measurement of the magnetometer without the sample to establish a baseline measurement of the empty magnetometer chamber. He then lowers the sample into the chamber, where the niobium sensor immediately responds and flashes the magnitude of the sample's magnetic field on the readout of a digital voltmeter. Kent adjusts the handle on the outside of the instrument to orient the sample, so that the reading is taken along the two axes of interest (say, x and z). Only then does he push a button to record the measurement—which is immediately stored in the Apple II's memory. After reorienting the sample by 90 degrees, the procedure is repeated. Six pairs of measurements are made for each sample, to provide independent confirmation along three axes.

After completely measuring each sample, Kent calls up from the Apple's memory the file on the core from which the sample was taken. Through a simple trigonometric program the Apple automatically converts the x,y,z coordinates of the sample's axes to geographical latitude, longitude, and orientation in the earth. It also calculates the sample's magnetic vector—that is, the direction and amplitude of the magnetization—with respect to north, east, and down. All the raw measurements and the calculated information are then printed out onto half a sheet of computer paper. Kent then inserts another sample and begins anew.

The full set of actual measurements and calculations for each sample from the cryogenic magnetometer and the Apple computer requires only three to four minutes. "The most time-consuming part of the procedure now is physically inserting each sample into the one-meter shaft," Kent grins. After each tenth sample, the information is transferred out of computer memory onto floppy disks for permanent storage.

Quality as well as quantity

"Adding the Apple personal computer made the process of recording the data equal to the efficiency of the magnetometer in measuring it," Kent remarked. The new cryogenic magnetometer plus the Apple II has measured literally thousands of rock samples in the past three years—probably five times as many as the spinner magnetometer could have measured and recorded in the same length of time. Moreover, through a

"The addition of the personal computer has also given us the leeway to experiment."

program that compares the six pairs of measurements for each sample, Kent also has the computer produce sophisticated analyses of the internal consistency of the data. The Apple II also plots data on maps and charts.

More than just shortening the time required for gathering each measurement, the addition of the personal computer has improved the quality of the results. "We can now take more measurements of any one core, thus getting more detailed and complete information, because we don't have to worry about how much time is spent on each measurement," Kent explains. "In one 1½-meter section of one particularly interesting core a student is going to measure 900 samples. This is the type of task that we probably wouldn't have even attempted several years ago, because the sheer time required to do the measurements would not have made it worthwhile. We operate on a competitive basis with other grants and we couldn't have justified such a project on the length of time.

"The addition of the personal computer has also given us the leeway to experiment," Kent continues. "You see, if your project requires that you spend a tremendous amount of time in measurements, you have to be more assured of the project's success at the outset of the project—which in science is not always possible. Now, because the measurements can be made up to five times faster than before, we have the freedom to try hypotheses without being so concerned that it if one hypothesis dead-ends, the experiment was all a waste."

The benefits have been financial as well as scientific. "In effect, we invested $3000 to $4000 for the computer," Kent says. "Several years ago my bill for using the central computer used to run up to $500 per month—plus the salaries of the technicians taking the measurements and the personnel keypunching the cards. Now I don't have those monthly costs—so within the first year of operation I realized the savings and justified the computer's cost."

Although he is an enthusiast, Kent is still in the process of working out the bugs. "To be honest, the bottleneck is still the software. We've written most of our own software—editing programs, programs to handle the data—or we've adapted generalized programs to meet our specific needs." Generally, Kent and his colleagues have been converting their old Fortran programs into BASIC—programs for transforming coordinate systems, performing error analyses, and plotting data. Kent does plan to get a modest Hewlett-Packard plotter for simple graphics. For sophisticated graphics and for papers, however, he still takes advantage of the large-format plotter at Lamont-Doherty's main computer center. "Most of my computing needs are fairly low grade. For most purposes, I don't need a big number-cruncher. I can do virtually everything I need with a small personal computer—with substantial savings and convenience. In my view, personal computers are useful to those who handle normal, day-to-day processing that doesn't require huge CPU capacity."

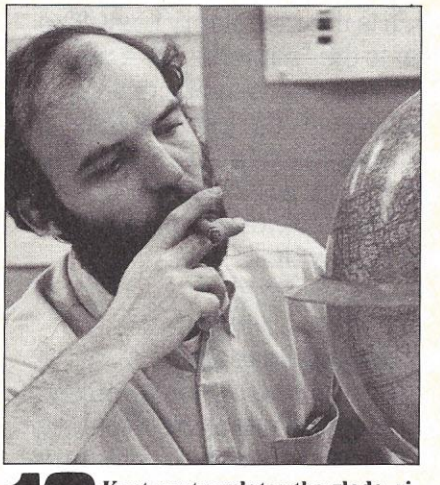
Daring to ask

For geologist Dennis Kent, adding a personal computer to his cryogenic magnetometer has opened the door to bold questions impossible to consider realistically before. In geology—as in so much of science—much raw information has to be meticulously gathered, collated, and compared before one can begin to discern the nature of things, let alone changes in those things over time. In Kent's case, his scope is nothing less than the entire planet, and his time frame extends back half a billion years. The magnetometer measures the characteristics he needs, but the personal computer allows him to dare to explore interrelated factors in more complex detail than was feasible before.

The most interesting questions that can be asked are almost always the most complex. Think of a child's knack of coming right to the point: "Why does the wind blow?" "What makes the sun shine?" These are basic questions of meteorology and thermonuclear reactions—questions of intricate complexity.

Interesting questions are by no means limited to science; they abound in the demography of opinion polls, psychology of human behavior, and world economics. In the past, the sheer intricacy of trends and interactions, the numbers of variables involved, and the time and expense of gathering and analyzing meaningful information severely restricted human ability to gain an adequate picture of the whole. All too often the necessary approximations resulted in surveys or economic projections that have been at best unsatisfying and at worst trivial or misleading.

Kent's experience, however, shows that when a personal computer is added to tools already available, it begins to become humanly possible for individual scientists—and others—to dare to ask deeper questions and to gain a more realistic perception of the nature of things.



10 Kent contemplates the glode, visualizing where the North American continent might drift 200 million years from now.

IF YOU'RE CONFUSED PERSONAL COMPUTER,

At this moment, there are no less than 50 personal computers on the market. And more are being introduced every day.

On one hand, having all those options is a good thing. On the other, it can make picking the right one pretty difficult.

Computers come in two parts. You have to buy both.

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstration, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.

Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn.

Some people, however, will tell you that software has to be complicated to be powerful.

Nothing could be farther from the truth.

Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

The PFS family is designed the way we think all software should be: simple, straightforward and powerful.

Currently, three products make up the family. PFS:FILE, PFS:REPORT and PFS:GRAPH, with more programs on the way. Here's a little more about each of them.

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FILE lets you arrange your information in "forms" you design yourself. So you can get at and really use your information in ways never before possible.

What's more, FILE lets you change the original form without having to redo the information on it.

PFS:REPORT. Making the most of your information.

REPORT summarizes the information on your forms so you can use it to analyze, plan and make better-informed decisions.

With REPORT, you get presentation-quality reports—sorted, calculated, formatted and printed—automatically, in seconds.

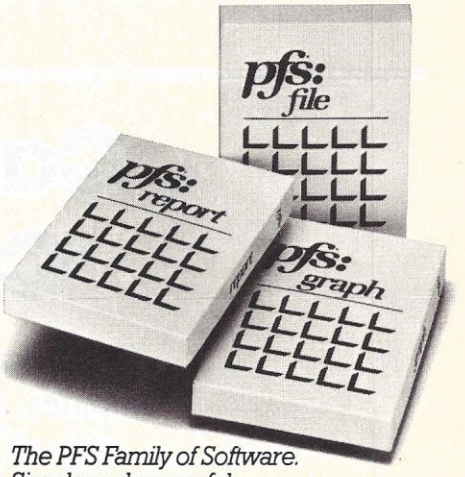
PFS:GRAPH. Instant pictures.

GRAPH gives you presentation quality bar charts, line graphs, and pie charts, in black and white or color, on paper or the computer screen. To get a clearer picture of things and spot trends instantly, you simply enter your information and specify the kind of graph or chart you want. GRAPH does the rest.

You can also mix and match line and bar graphs, or even stack or compare up to four bar graphs simultaneously.

And GRAPH will work with PFS:FILE, VisiCalc® files, or data entered directly into the computer.

Best of all, compared to the cost of hand-drawn graphics, GRAPH can save you enough money over the course of a few months to pay for the computer it runs on.



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CIRCLE 94

Can You Take A Catastrophe?

Can your small business, relying on a personal computer, survive fire, earthquake, or flood? Yes it can—if you make careful disaster plans now

by David Gabel, Senior Editor

Jerry Isaacson, a director of the Computer Security Institute in Northborough, Mass., teaches seminars on computer security, mostly for data-processing managers of Fortune 500 companies.

"No large corporation has ever gone out of business because of a computer catastrophe," he says. "The first one that does will be a small firm that relies on personal computers."

The reason, he says, is that while major corporations generally take elaborate steps to protect their mainframe data against computer mishaps, smaller firms typically do not. "They should," Isaacson declares. "And it's not all that difficult to do. You have to do everything that the guys in the big shops do, but scaled down to personal size."

The first step in constructing a plan for recovery from damage to your computer is to classify the kinds of damage that are possible. And the first classification step that can be made is to divide damage into two categories—that which is merely annoying and that which is truly catastrophic.

Annoying damage is the kind of damage that happens as a result of difficulties in the environment in which you work; such damage doesn't put you out of operation, but it can slow you down or cause you to restart—perhaps losing data in the process.

Catastrophic damage is the havoc from some event that puts your computer out of operation for a relatively long time. Such events can include fire, earthquake, and flood. If you're working in a part of the country in which there's some likelihood of catastrophe (say, from hurricanes in the South, tornadoes in the Midwest, or earthquakes in the West), you'll need a plan to deal with the results of the catastrophe.

The sidebar titled "One Man's Fight Against a Computer Disaster" on page 80 describes one person's actions for recovery from a fire. There are other, less drastic remedies that can be taken, and we'll talk about them in more detail later. The more common difficulties that you're likely to encounter come from damage that's simply annoying, so we'll turn there first.

Dirt and wear

Have you ever tried to read a file from disk and had the drive respond with clacks and whirrs, and then had the computer respond to your request for information with I/O ERROR? Most of us have, because a disk drive is more prone to error than any other component of the computer system, with the possible exception of a printer. Both disk drives and printers are electromechanical devices. They tend to get dirty, overheated, maladjusted, and cranky. If the faulty condition is allowed to persist in a disk drive, the hardware can damage floppy disks, and that can be a real headache. You'll probably see error messages arising from problems in a disk drive more often than with a printer, simply because the drives are used more than many printers hooked up to personal computers. What can you do?

If you talk to people in the computer industry about problems with floppy disk drives, the cause most often mentioned is dirt. Air is laden with dirt particles of all shapes and sizes. The dirt sticks to read/write heads and causes them to wear more harshly on the magnetic disk. Common house dust is one source. Tobacco smoke, however, is a particularly pernicious form of dirt. It gets into everything, gums up moving parts, and puts a black coat of tar-like soot on components. It can cause additional wear on disks and read/write heads. For this reason, Isaacson's Computer Security Institute's recommendation is that no smoking be allowed in the computer room—any computer room.

Large-computer installations used to have a striking poster illustrating the various kinds of foreign objects that could get between the disk and head in a hard disk drive (the kind with a removable disk pack, where the heads were held a fixed distance above the disk during operation). Foreign particles were drawn to scale with respect to the height of the head above the disk. The oil left by a fingerprint looked like a boulder, and a

photo by George B. Fry III

ONE MAN'S FIGHT AGAINST A COMPUTER DISASTER

by William L. Shelton

As a systems engineer in the U.S. Navy's Advanced Systems Test and Analysis Department in Hueneme, Calif., I have the use of an Apple II Plus, two disk drives, an Epson MX-80 printer, and an NEC 1201M monitor. But three months ago the building I work in was destroyed by fire. Fortunately, the computer, disk drive, a plastic box of about 30 disks, and the monitor were rescued by firemen. The printer was presumed lost.

As soon as the firemen left the scene, I retrieved the rescued equipment, all of which had been heavily damaged by smoke and water. Having owned an almost identical system prior to purchasing an IBM Personal Computer, I thought it would be a challenge to see what I could do to salvage the remains. I then received permission to take the recovered units and disks home.

Once the equipment was safely deposited at home, my first problem arose: What was I going to do with it? After some deliberation, I disassembled the computer and lightly sprayed it with a garden hose to remove as much of the ashes and soot as possible. After this clear-water bath, I swabbed the motherboard, keyboard, and all the integrated circuits with alcohol to remove the thin film of soot that remained. The drying process was accomplished with an ordinary hand-held hair dryer. The monitor suffered the same indignities.

The disk drives were next. I took them apart, sprayed them with the garden hose, gave them an alcohol bath, and dried them. When I later inspected the read/write heads, however, there was still a layer of soot and ash on each head. This I quickly remedied with cassette-recorder head cleaner. The mechanical parts of each drive were then sprayed with a thin coating of rust inhibitor and lubricant.

The Apple power cord, completely melted by the heat from the fire, needed replacement. I purchased the necessary cable and reconnected the equipment. The system worked normally.

The disks—which included a Stoneware DB Master program, the Apple DOS 3.3 program, some blank disks, and about 40 radar and infrared systems analysis programs—posed the next problem. The plastic box that held the disks had about a half inch of water and ashes at the bottom. Step one: Drain the water. Step two: Cover the floor with newspapers and lay the disks down to dry. (This was a big mistake. The soggy, ash-filled liner inside the protective jacket dried right into the disks' surfaces, so after a few days the disks wouldn't spin inside their jackets.) Step three: Come up with a solution.

What I eventually did was carefully trim the bottom edges of the disks so that the disks could be removed from their jackets and washed. (This was my second big mistake. The top of the disks—the edge that is held when you insert the disk into the drive—should have been cut.) Each disk was removed from its protective jacket and dipped in a pan of warm water. Next, a drop of shampoo was placed on the disks, which were washed carefully and dried. The jacket liners were also rinsed and dried.

The liners dry, I inserted the disks back into their protective envelopes and sealed them with plastic tape. Since I had removed the bottom edges, the tape couldn't extend across the jackets in one piece, because it would cover the disks' head slots.

One caveat: None of the above handling is recommended. But, three months after the fire, there has been no loss of data or programs, and the disks appear to be functioning well.

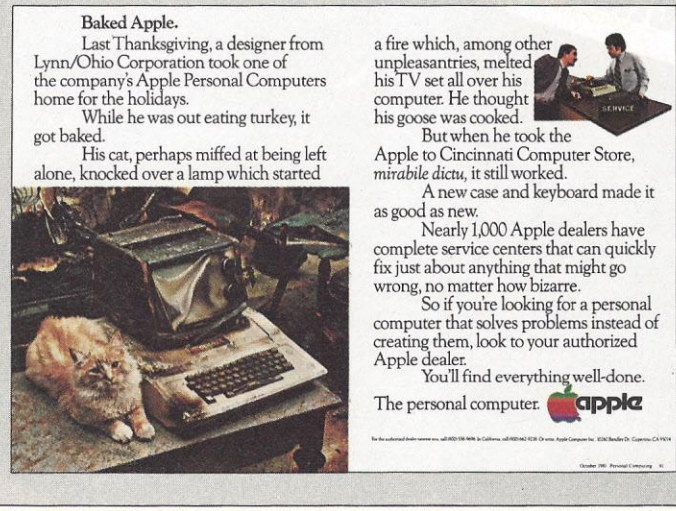
Three days after the fire, personnel were allowed to go through the debris in search of other recoverable items. I searched for the Epson MX-80, which, prior to the fire, was kept on a desk separate from the computer. I poked around in the charred debris and found the printer. It was almost completely black and full of water-soaked ashes and particles. The case had not melted, but the metal parts had started to rust.

I took the printer home, completely stripped it, and started my cleaning routine. The metal parts that had started to rust were cleaned with fine steel wool and given a coating of rust inhibitor and lubricant. I assembled the printer, replaced the ribbon, and turned it on. The test pattern was perfect.

In the days following my initial cleaning, the Epson has been cleaned again to get rid of some rust that started to form. Other than that, there have been no problems with the printer.

My efforts saved the Navy $3000 in computer equipment and peripherals, not including the time it would take to rewrite the radar and infrared systems-analysis programs.

All of the equipment mentioned is the property of the United States Navy. This article is not an endorsement of any of the product manufacturers. In addition, the procedures used to salvage the equipment are not to be considered standard Navy procedures. Finally, the opinions presented are those of the author, and not those of the United States Navy.



Could you suffer damage to your business computer? You bet. Could you survive that damage? You could.

smoke particle like a mountain. A human hair was positively gargantuan. The illustration was usually posted in a conspicuous spot near the entrance to the computer room, to remind people to wipe their feet and put out their cigarettes before entering.

In the big hard disk drive, the presence of a foreign object, even as small as a grain of dust, in the fixed gap between the head and disk, could cause a mini-catastrophe—a head crash. What happened was that the bit of grit would score the surface of the disk, building up an uneven set of ridges and valleys. Continued use of the ruined disk could then actually damage the drive's read/write head. When that happens, the disk can only be restored by sending it out to a dealer to be completely resurfaced and reinitialized—but at the price of erasing all the information on it.

Personal computer disk drives function differently from the hard-disk-drive technology of large installations. Floppy disks are coated with a medium similar to the coating on recording tapes, which is designed to be in direct contact with the read/write head. Furthermore, the flexibility of the floppy disk allows the surface to bend under irregularities, meaning that floppy disks are not as susceptible as hard disks to damage from dust or smoke. But that very flexibility is also a weakness, because the dirt and grime will cause additional wear to the surface—meaning that the disks do have to be changed periodically. How often you need to change your disk depends on the cleanliness of your environment and how heavily the disks are used. If they're in constant use, they may have to be changed in six months; if they're only used occasionally, they may last for five years. In either case, it's wise to make a duplicate of each important disk long before it wears out—because you may find you need the information most just at the time the disk becomes unusable. And, there's no way to clean or restore a floppy disk.

Just as disks wear, so does every other moving part in a floppy disk drive. Simple preventive maintenance can work wonders in stopping major problems. Heads need to be cleaned after about 10 hours of use, and there are several head-cleaning kits on the market that will do the job in an easy, straightforward way. One product, Verfin, manufactured by Zolman International of San Francisco, Calif., consists of a white fiber-like material encased in the familiar plastic casing of a floppy disk, which is inserted in the drive like a regular disk and allowed to run for 20 seconds.The spinning of the cleaning material past the head cleans the read/write head.

After 30 hours

The heads also need to be demagnetized. Ken Lubitz, marketing director for the consumer-care products division of Nortronics (Minneapolis, Minn.), a firm that supplies heads for the computer industry and magnetic-device maintenance products for consumers as well as the industry, says the heads need to be demagnetized after about 30 hours of operation. That's 30 hours when the head was in use, not 30 hours elapsed time.

The problem is that iron oxide can build up on the read/write heads of a floppy disk drive, just as it can build up on the heads of an audio tape recorder. That oxide buildup on the heads can cause data errors. Continued use of the drive can mean that the head acquires some slight residual magnetism, which can foul up bits of your data. In the tape deck of a hi-fi system, the residual magnetism of the dirty heads causes noise in the signal, which you hear as static. In a computer, the problem is worse—because the noise causes bits of data to be lost. If you want a clean signal or accurate data, you have to demagnetize the heads. Nortronics has recently introduced a product that will demagnetize heads (Model CMPF 205, a computer-head degausser).

Magnetic disk drives can also develop a number of misalignment problems. Just like an automobile needs to have its wheels periodically realigned, disk drives also need to have the heads aligned and the motor speed checked. Experts recommend that you take the drive to a service center—your dealer's or another that you trust—periodically, for a general tune-up. Again, the frequency of your visits will depend on your specific equipment and its work load. Such preventive maintenance will save you a lot of annoyance. If you're one of the fortunate few who have a Winchester disk drive, clean or change the filters that keep dirt out of the head-disk assembly every so often. Your dealer can tell you when you need to do that.

Printers are also electromechanical devices needing periodic cleaning. Here the cleaning job is almost comically straightforward—put a small nozzle on the nose of your vacuum cleaner and suck out all the dirt and bits of paper that may have accumulated inside the case. Depending on use, such a cleaning may be necessary three or four times per year.

And what about those aggravating, unexpected accidents such as spilling coffee or a soft drink into the computer's keyboard? Although with the keyboards on the market today such a spill is unlikely to cause an electrical short, the cream or sugar in the drink can gum up the action of the keys. In theory you could carefully unbolt the casing and clean up the mess with few or no ill effects, but in practice such action may void your warranty. Your wisest course is to haul the keyboard to your dealer and get it professionally cleaned.

Problems with electricity

If difficulties with disk drives are more annoying than catastrophic, problems with the power your com-

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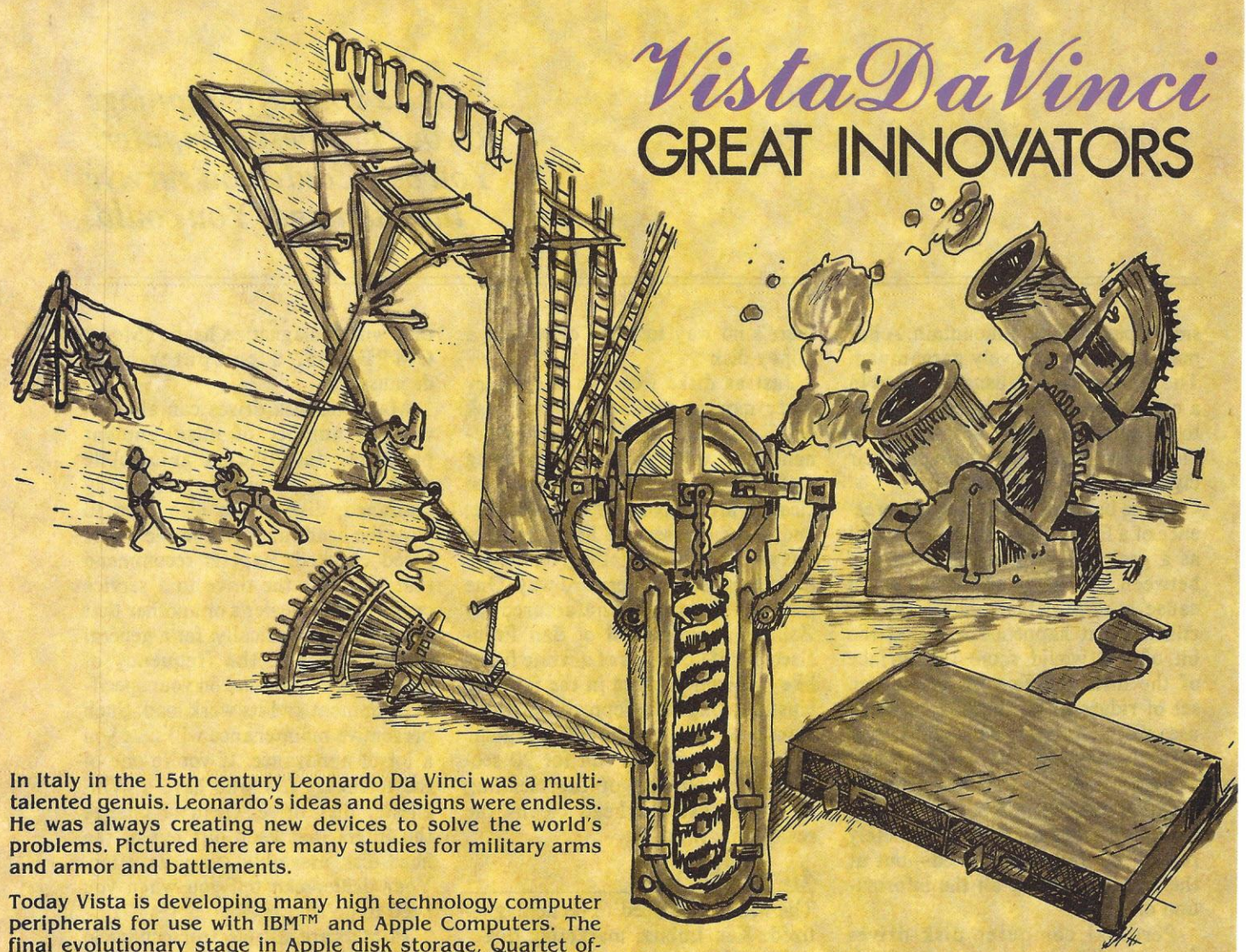

In Italy in the 15th century Leonardo Da Vinci was a multi-talented genuis. Leonardo's ideas and designs were endless. He was always creating new devices to solve the world's problems. Pictured here are many studies for military arms and armor and battlements.

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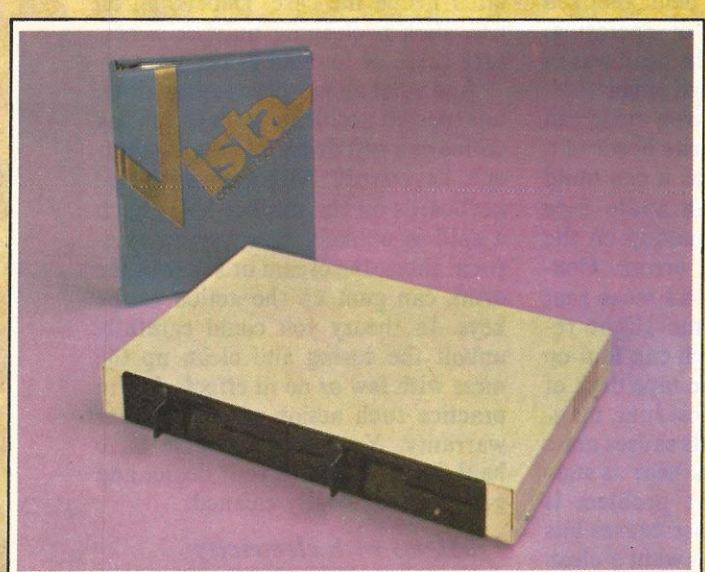

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CIRCLE 34

"Most computers can't guarantee with any certainty that data won't be lost under brown-out conditions."

puter uses can be more catastrophic than annoying. Two power problems can cause real trouble for your computer—overvoltage and undervoltage. When the dog days of August come, everyone turns on the air conditioner, at least in those areas where heat and humidity are ferocious. It's a good thing we have air conditioning, because both people and computers need it. Harry Garland, president of Cromemco (Mountain View, Calif.)—a company that's been in the personal-computer business from the beginning—says you shouldn't operate your computer above an ambient temperature of 80 degrees. Higher temperatures can cause difficulties for disk drives and for some of the other personal-computer components.

The use of air conditioners, though, causes a serious electrical demand situation for the electrical power company. If there isn't enough generating capacity available to meet the demand, the power company has two choices: It can buy power from a neighboring utility, or it can reduce voltage in the system. The company often chooses to reduce voltage—to effect a "brown-out"—because the neighboring utilities are suffering under heavy electrical demand as well. When the power company reduces the voltage it reduces the overall electrical demand, because appliances connected to the system draw less current, which means less power.

Your computer is one of those power-consuming devices. When the power company puts a brown-out into effect, your computer will draw less power than it did before. That may be okay, or it may not, depending on the components in your machine. In a worst case situation, you could lose part or all of your data in memory as the power fluctuates, and you may have only fitful access to the computer system. It's a good idea to develop the habit of saving work in progress onto a disk—perhaps as often as every 15 minutes. "Most computers," says Garland, "can't guarantee with any certainty that data won't be lost under brown-out conditions. So you have to ask yourself, 'How important is my system?' If the system is vital to you, and you have to keep it running, and you're in an area with frequent brown-outs, you have no choice but to get an uninterruptible power supply."

An uninterruptible power supply (UPS) is a storage device that delivers power to your computer when the power company can't. When the power grid is operating normally, the UPS stores energy against the day when the grid goes into brown-out or (heaven forbid) black-out conditions. Sensing a lowered line voltage, the UPS kicks in and provides backup power. When power is restored to normal, the UPS will charge itself up again in readiness for the next emergency.

There are two general types of UPS available. One kind provides enough power to let you save out the data you're working on and conduct an orderly shutdown in the event of a power problem. If your system's continuous operation isn't a major requirement, this kind of UPS will probably do fine. But if you need to have constant operation, you may have no choice but to go for a UPS that will provide long-term (several hours) backup power. Your dealer or service provider can recommend the kind that's best for you, and tell you where the devices can be purchased. Two companies that manufacture uninterruptible power supplies are Cuesta of San Luis Obispo, Calif., and RH Electronics of Buellton, Calif.

Noise is a killer

Your computer doesn't like noise. It doesn't object to the kind of noise that comes from a rock band, but it hates the kind that comes on the power lines—power surges, spikes, and the like. Noise in the power supply can make the display blink or drift, and cause read errors on the disk drives. Severe power-line noises can make the computer lock up.

If the computer has a stable, well-regulated power supply, then noise will be taken care of, except for massive surges such as lightning strikes on a power line. In fact, some people—such as Garland—go so far as to say that power supplies in computers are good enough so that surge suppressors and other protection devices probably aren't necessary.

Others, such as Isaacson, are in the other camp. Isaacson recommends lightning arrestors on the power lines and surge suppressors at critical components as devices that can help you reduce damage to your computer system.

On the power line

Whether you need a device to clean your power lines or not probably depends on a host of factors. One such factor is: What other heavy electrical equipment might be sharing the same power line? One of the computers in the editorial offices of *Personal Computing* in northern New Jersey is plugged into the same power line as a cold-drink vending machine. When the refrigerator compressor used to turn on, it caused the display of the computer to lose horizontal synchronization and do a weird dance. Installation of a plug-in, power-line filter at the computer did away with the problem.

Since the starting of heavy electrical machinery is a frequent cause of momentary variations of voltage, a surge protector could save you some grief. Two manufacturers of surge protectors are Electronic Protection Devices of Waltham, Mass., and Dymarc Electronics, Inc. in Baltimore, Md.

There's another problem associated with electricity — static. Static electricity, if it gets into the computer's ground lines, can cause an increase in the voltage of the ground plane; the ground plane is supposed to be zero volts, and is interpreted by

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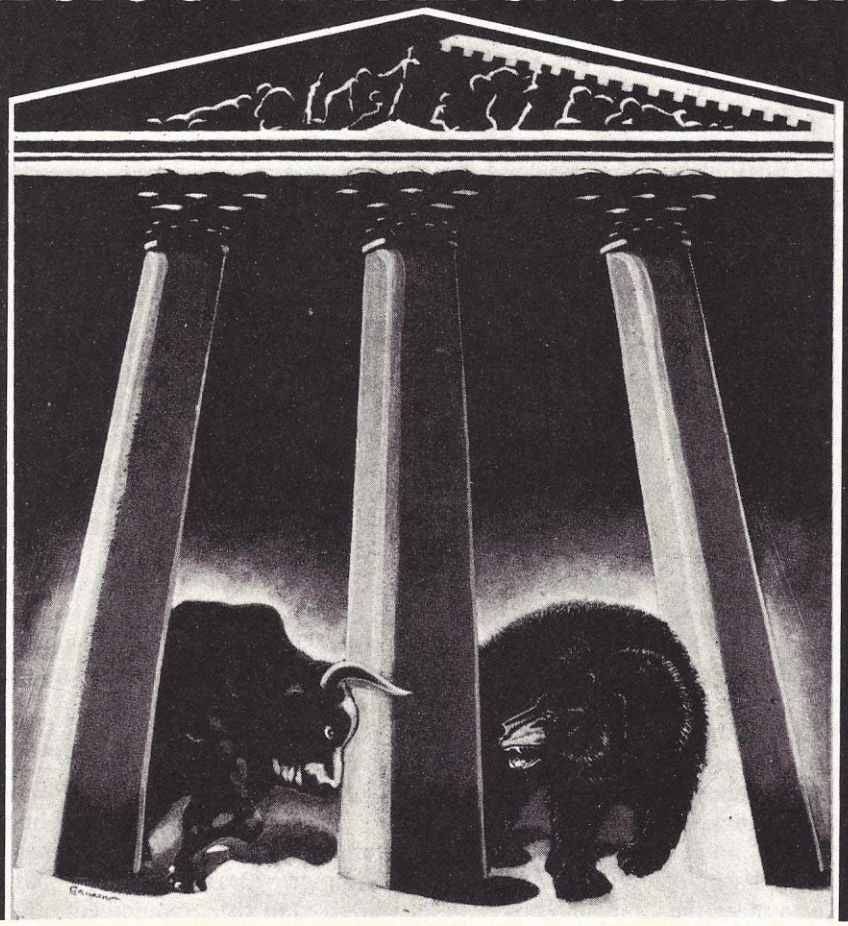

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CIRCLE 49

There are stories told of people who have touched screens with pencils and have seen sparks jump.

the computer as a logic "0." If the ground plane's voltage rises, the logic circuits inside the computer may not be able to tell a logic "1" from a logic "0," and data can be lost.

If your computer has a metal chassis, then you probably will not have a static problem, Garland says. The reason is that the electrical ground for the chassis is separate from the ground plane for the computer's logic, and a static charge that gets into the chassis can't affect the system's data lines. Yet there are stories told of people who have touched their video screens with pencils and have seen sparks jump to the screen. Lubitz relates that such static sparks present a problem in Minnesota, where his company, Nortronics, is located. As winter sets in and the heat goes on, building interiors dry out and static electricity builds up. He says it takes about a 60-kilovolt charge to make a spark jump one inch—a charge that is easily built up with leather-soled shoes on certain carpets. Once a spark jumps to your machine, the computer often locks and refuses to do anything—even the screen is frozen. If that happens, there's no alternative but to restart, and wave goodbye to whatever data was in memory.

If you have a problem with static electricity, then you'd do well to get an anti-static mat to set under your computer, and to clean your screen now and then with an anti-static spray. Worrying about the power-line grounds in your building won't help much, Garland says, because if your system seems to be bothered by static, the problem is inside the computer. One very good way to defeat static electricity is to raise the humidity. Keep a humidifier running in your computer room and you may see static problems—and the resultant data losses—go away.

But in the event that ...

Let's say you've done everything you can think of to make the annoying and near catastrophic difficulties you might experience go away. What if the unthinkable happens? What if your business suffers a fire? What if the building collapses in an earthquake? What if the water main breaks and floods your offices? What do you do if your computer isn't available for your work?

Jerry Isaacson says you have to keep your objective firmly in mind. "The question," he points out, "isn't 'How do I recover my computer?' The question is 'How do I keep the business going?'"

First of all, you must have a plan. If you go about your business thinking that nothing will ever go wrong, you might be happy in your unconcern, but you're taking a chance with your bread and butter. A secure backup plan is essential if your business depends on the computer.

A good plan takes the two-layer approach: First, you must plan to secure your software; and second, you must plan to have alternate hardware available during the time your own computer system is out of operation.

The software part is relatively easy. Your dealer probably told vou when you bought the computer that you should make a backup copy of the software. If the software is protected in such a way that the manufacturer prevents you from duplicating the disk yourself, you can usually obtain a backup copy from the dealer at a nominal handling charge. Others will send you a backup copy when you mail in the registration card. (By the way, it's a good idea to send in that registration card. It often makes you eligible to receive updates to the program at a low cost.) You also need backup copies of your data. A good archiving system is known as a three-generation backup system. It's also called a grandfather-father-son system. Here's how it works.

When you run your general-ledger system today, for example, you generate a disk file that shows the current status of your business. That's the son file. Yesterday's file, which you updated to produce today's son file, becomes the father file. Day-before-yesterday's file is now the grandfather file. At the end of each day, you should store a copy of yesterday's file—the father—along with the grandfather file for good measure. Tomorrow, when you run a new son file, today's son file becomes the father, and the father file becomes the grandfather file. At that point, you can get rid of the old grandfather file. By this three-generation archiving technique, your backup files are continually updated with no extra effort on your part. And in the event of a disaster, your business would never be more than one day behind.

Off-site storage

Where should you keep your backup files? If you keep them in the same building as your working programs and data, you may as well not have them: If the building is unavailable or destroyed, you're still up the creek.

The best idea is to store at least one of these files off site. Isaacson says a bank vault is a good storage site. A bank vault is maintained at a safe temperature for your data (less than 150 degrees F) and is shielded from stray magnetic fields that could wipe out your data. The vault is also open during business hours, when you might need to get to your data.

How can you keep your whole business running in the event of a disaster? If your computer has bought the farm, but you still need to run your computerized business systems and pay your employees, off-site processing is the best way to go. In the data-processing business, large companies make careful provisions for alternate off-site operations. Large corporations will sometimes pay a fee to have an alternate processing site available in the case of a computer emergency. Such sites have equipment comparable to that installed in the company's in-house data processing center. If the company suffers

a disaster, operations are shifted to the alternate site.

Any small business relying on personal computers is probably not of the scale where such elaborate precautions are necessary or warranted. Still, you may need some sort of alternate-site plan. There may be another small business in your city with a comparable computer used in its daily transactions. If that's the case, it's worth finding out whether or not its computer is used around the clock. You might be able to arrange a time swap in the event of an emergency—if your office should burn, you could use the other business' computer at night, and vice versa. If you do strike that kind of a deal, be sure to rehearse the disaster/recovery scenario. That way you can get used to where your counterpart keeps equipment, paper, ribbons, and the like. You can also make sure that your software will run on the alternate machine. (Two o'clock in the morning after a fire is not the time to find out that your payroll program needs a different set of format commands than your friend's computer provides.)

While you're at it, you can arrange to have each day's father generation of your data files stored at your alternate processing site. Then, with the grandfather rotating each day through a bank vault, you're in pretty good shape, in case the roof comes down.

There's still more

What about programs—particularly unique, custom-designed software? You'd do well, Isaacson thinks, to make sure you have backup copies of your programs in a safe place—the bank vault again. And while you're at it, make sure there's a copy of the documentation safely stored. "If worse comes to worst," says Isaacson, "you can replace everything in the shop except the information and custom software. You have to make sure that you have made provisions to get to those in case of a disaster."

Replacing hardware may be more of a problem than you thought it would be. It is, after all, expensive. Ten thousand dollars may not sound like a lot, in business terms, but it's still a significant chunk of cash, particularly if you borrowed the money to buy the computer. If that computer is destroyed, you'll have to pay off the loan and still replace the hardware. That's why Isaacson suggests that you get the computer insured. He notes that several firms now offer insurance for both hardware and software, and business-interruption insurance may be available at a price you can afford. One company specializing in such insurance is the Columbia National General Agency of Columbus, Ohio. A check with your commercial insurance carrier should get you on the right track here. Your carrier may even be able to help you with recovery planning.

We obviously can't tell you everything you need to consider to keep yourself operating if your computer should suffer some kind of damage—annoying or catastrophic. There are too many things involved that have to do with the specifics of your personal setup. We can tell you, however, that you need to look at your situation and plan for the unthinkable. Computer-security experts tell their large corporate clients that a disaster plan is top management's responsibility, and that the top people in a corporation need to ensure that recovery plans are in place and workable.

In the case of a small business, you're probably top management anyway. So you're interested both from the data-processing side and from the corporate operations side. That first small company to go out of business from a disaster to their personal computer system won't be yours, if you've taken the necessary precautions, laid plans for recovery, and rehearsed them.

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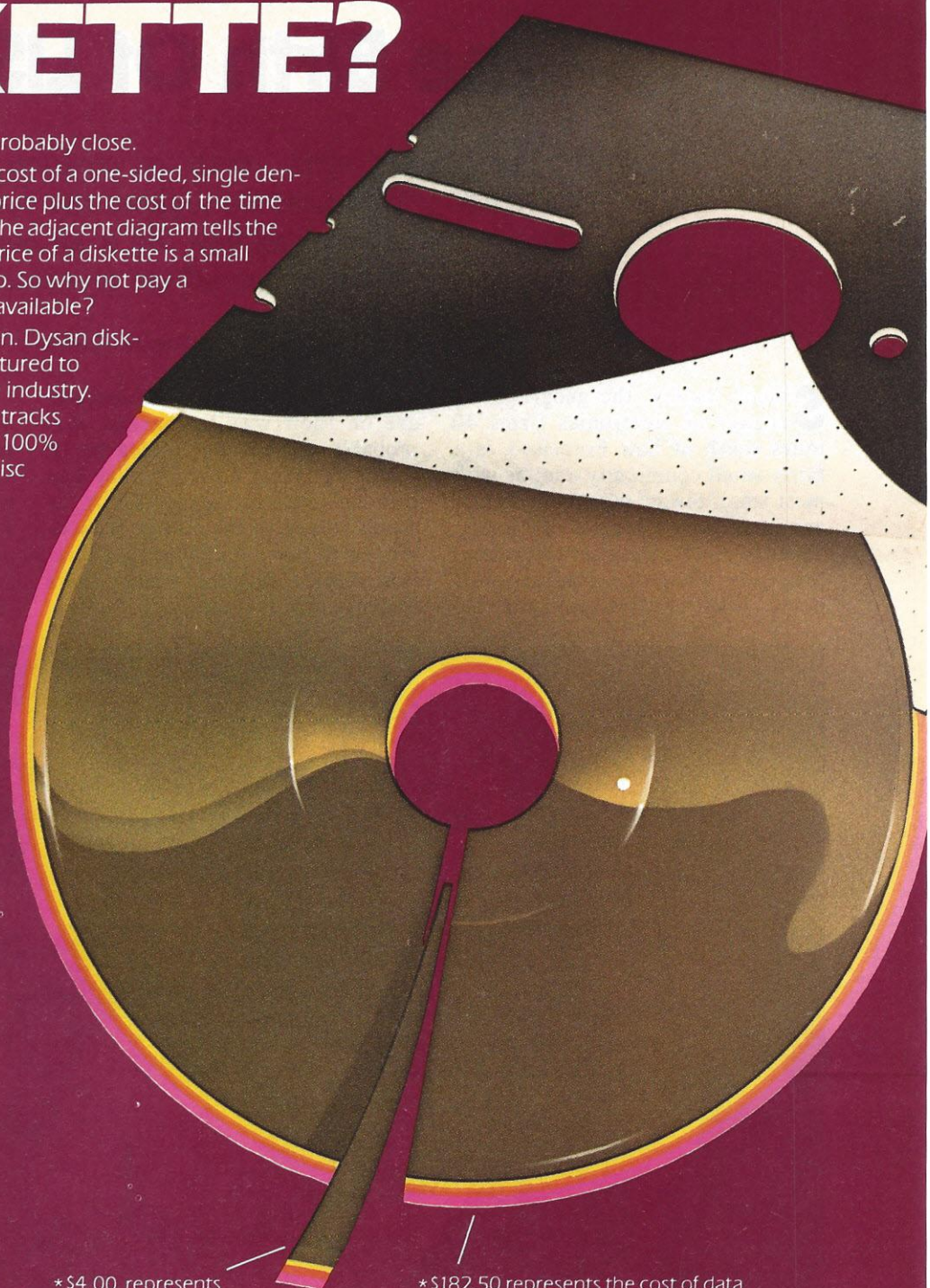

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CIRCLE 21

The Birth Of LISA

The LISA project—even the mention of its existence sent rumors throughout the computing industry. But where and how did it all begin? Who were the men behind the machine?

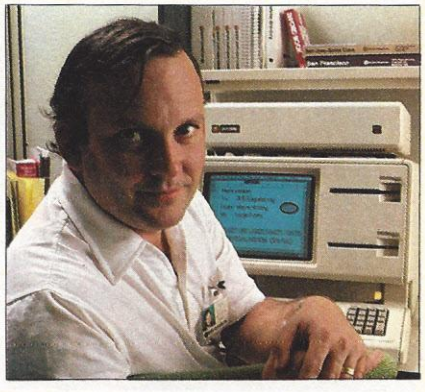
by Michael Rogers, Senior Editor

Silicon Valley, the geographical cluster of electronics firms 40 miles south of San Francisco, is a fairly small community and, as with most small towns, gossip and rumor are important elements of society. There is never-ending curiosity about precisely what one's neighbor is doing—what products are under development and what new technologies are on their way to market. But probably the longest-running bit of drama in recent Silicon Valley history has revolved around "LISA," a secret housed in the scatter of modern, earth-toned buildings that comprise Apple Computer's headquarters in Cupertino.

LISA, the ultra-friendly, long-awaited addition to the Apple product line (for more details, see Hardware of the Month, page 181), attracted far more attention than did the development of the average new computer. For more than two years, stories about the project have circulated—focused around the notion

photos by Lee Youngblood

The LISA project design team, in the photo above from left to right: John Couch, Bruce Daniels, Wayne Rosing, and Larry Tessler.



Wayne Rosing, director of engineering for LISA, describes the computer's development as the "largest software project ever undertaken for a microprocessor."

that this would be the company's breakthrough product for the 1980s, intended to do for office systems what the original Apple did for the entire field of personal computing.

On that count, only time will tell. But the LISA project did produce a remarkable machine, and the collective nature of its invention is a process worth examining.

John Couch, the rangy, energetic head of the personal office systems group at Apple, arrived from Hewlett-Packard in 1978—at half his previous salary, but with an exciting assignment: to produce a strategy for the company's future personal-computing software. "To spec out the personal computer of the 1980s," he says. "To ask, 'What's going to be the next Apple II?'"

The first part of the answer was clear: The next great advance would take place in computers for the office, simply because that's where the resources are to purchase sophisticated technology. Couch recalls sitting around in the office of Steven Jobs, Apple's co-founder and now chairman, "with our feet up on the desk, thinking about what directions to go in. What we said was that we wanted to replace everything in his office—but we didn't want to change the way people did things."

The second part of the answer was Couch's feeling that the next major step forward would lie in a software revolution, rather than a hardware evolution. Couch became vice president of software and, during a period when all of Apple's development projects were given women's names, launched LISA. (Most code names are dropped when projects reach the market, but LISA fit the human dimensions of the machine so well that the name stuck. At the last minute, a suitable acronym, Local Integrated Software Architecture, was reverse-engineered to fit the name.)

Couch recalls that one guiding principle for LISA came from his own father, whom he'd watched using a TRS-80 Microcomputer to run his health club. Every time Couch visited him, his father needed more programming to simplify his work. Couch realized that the machine could be made much easier to use if it integrated all the applications to begin with. At the time he was still working for Hewlett-Packard. "They thought it was a good idea," he says, "and wanted to put it in a $100,000 machine."

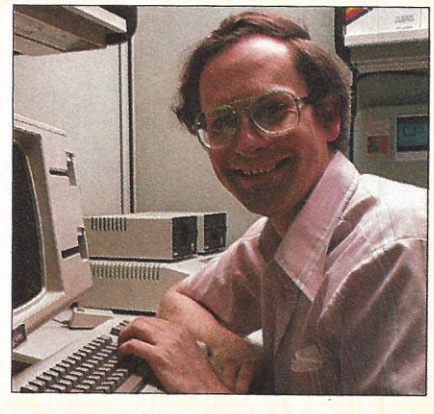
Thus LISA began with a fairly broad mandate: There was a general sense that the machine should be office-oriented, powerful, and easy to use. But no one was quite sure how to do it.

At first, ideas about the user interface—just how people would control the machine—involved then-current concepts like "soft" function keys (which have subsequently appeared in a number of other personal computers), says Bruce Daniels, one of the project's earliest software designers back when the entire LISA staff—soon to swell to over 200 people—could still fit in a few offices behind a nearby health food restaurant. No one was satisfied, however, and the entire question of how to proceed remained up in the air until December 1979.

That month, a small group of Apple engineers, intrigued by some published papers, traveled a few miles north to the Xerox research center in Palo Alto to see a demonstration of a new language system called Smalltalk. Smalltalk was unusually friendly and made extensive use of a hand-controlled "mouse," rather than a keyboard, to move the cursor on the screen. "We loved it—what they were trying to put across in ease of use," says Daniels. "It was almost a snap at that point. We all said, 'That's it—that's what we want to build.'"

A young Xerox researcher named Larry Tessler gave the Smalltalk demonstration. "I was about the only person there interested in personal computers," he recalls, "so they said, 'You can talk to these people from Apple.'" As it turned out, Tessler liked the Apple folks. In fact, six months later he joined the LISA project engineers, who just then were in the throes of designing the user interface.

By then a lot had already happened with the project: The decision to go with the mouse approach had taken three months, and three months after that there was a prototype machine. "(There were) breadboards, wires, all over the floor," says Daniels. "But it worked, and nobody got electrocuted." The decision-making process surrounding the hardware—which processor, how many circuit



Bruce Daniels, a software designer, remembers seeing the "mouse" and becoming convinced that he would make it an essential element of the new Apple.

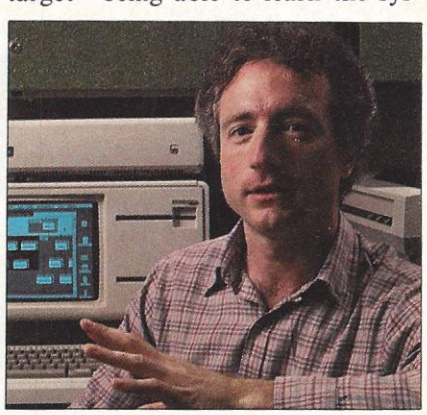
Probably the longest-running bit of drama in recent Silicon Valley history has revolved around "LISA."

boards—had been relatively brief by industry standards. But the next phase, the design of the user interface—the aspect of the project on which LISA would rise or fall—proved more trying.

A variety of mock-ups were built, and basic software decisions were made. The summer of 1980 saw such concepts as pull-down menus, scroll bars, and what came to be known as "cut-and-paste" procedures—all sophisticated uses of the cursor plus the mouse to replace keyboard input. Each change in the interface was subjected to great scrutiny, says Daniels, "even the question of how many buttons to have on the mouse."

Make it simple

The mouse question reflects a basic approach of the LISA team. "In any situation when there were arguments in both directions, unless one approach was a big advantage for experienced users, we'd choose the one that made it easier for the beginner," says Tessler. "In this case, we found that two buttons on the mouse were a slight advantage for experienced users, but not much. For beginners, when there were two buttons, they'd keep glancing down. With one button, they adapted right away. Since we had a very aggressive target—being able to learn the system in less than a half hour—we couldn't have 20 minutes of getting over your fear of the mouse."



Larry Tessler, a project engineer, left Xerox to join Apple six months after he gave a demonstration of Xerox's Smalltalk language to the LISA team.

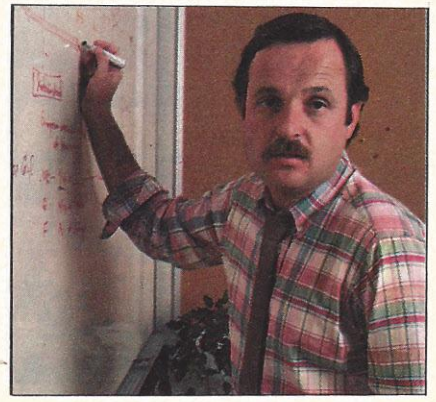
"That's pretty much how we spent the first year," Daniels says, "coming up with ideas, trying them out, finding the problems, and trying something new."

Designing a new user interface meant sampling a lot of users. Most tests were run on new Apple employees—they would be screened for previous computer experience, and a screened list would be delivered to the LISA group weekly. "Then if I was working on the spreadsheet," Tessler says, "I could say, 'I want two managers and three accounting clerks with no computer experience.' Or else I could request a similar group, except that they'd all used VisiCalc before." Hundreds of hours of observation ensued, supervised by psychologists, and much of it videotaped.

By the fall of 1980 the user interface was basically agreed on. Only then did the LISA group meet with Apple's marketing people to decide which application would be developed for first release. Initially, five were chosen—such basic functions as word processing, graphics, financial modeling. Then programming started in earnest. Within three months nearly 20 new programmers were hired, with an average of 10 years experience each. "They came from all over the country, from places with all kinds of styles," Tessler says. "There was a period of learning to live together, and then we got to work."

The first rough versions of application packages were ready by the summer of 1981. "They were buggy," Tessler says, "but at least you could sit down and play with them to get a sense of the user interface."

Then came perhaps the most difficult task: integrating the application packages so that data could go back and forth, and text could be cut and pasted between operations in much the same fashion that John Couch had envisioned for his father. And all of this would have to run smoothly under one on-screen display called the Desktop Manager.



John Couch, the head of personal office systems at Apple. His mission as one of the guiding forces of LISA was to develop the prototype computer of the 1980's.

Something interesting happened in this process. The job proved sufficiently massive and involved so many interdependent tasks that the LISA team began drawing PERT (Performance Evaluation and Review Technique) charts to track the various aspects of the project. The weekly updating of the charts grew tiresome, however, and it wasn't long before a program was written to do the job on the embryonic LISA.

"Suddenly everyone got excited," Tessler remembers, "and wanted to make it another official application package. At first, marketing was against it, until they saw it, and then *they* wanted to use it, too." Within a week the "LISA project" program was part of the product line, and it was only later that market studies were done to confirm that it would, indeed, be welcome in the world at large.

Not everything occurred so quickly for LISA. In fact, in terms of industry gossip, probably the most talked-about aspect of the project was its scheduling. "Since it's been leaked from day one," Daniels says, "the general perception has been that it's horribly behind schedule."

LISA was indeed long in arriving,

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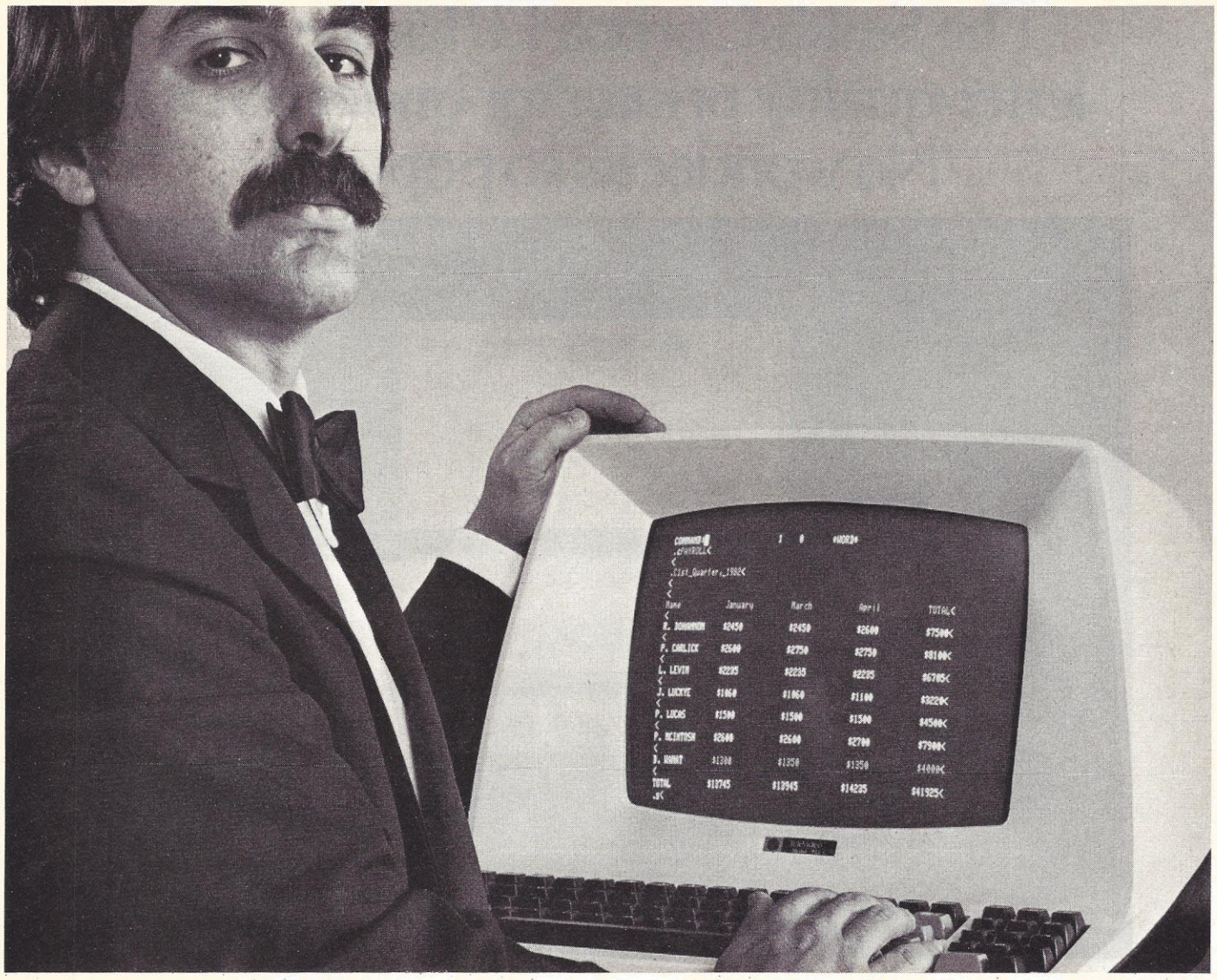

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CIRCLE 40

"We spent the first year coming up with ideas, trying them out, finding the problems, and trying something new."

and probably no one was more aware of that than Wayne Rosing, a soft-spoken, serious fellow who came from Digital Equipment Corp. to become director of engineering for LISA. "When I arrived in September 1980," Rosing says, "LISA was supposed to *ship* in March 1981. In fact, when I was interviewing for the job, I wasn't sure if I should say what I thought of that. I just indicated that I thought it was a little optimistic."

LISA, of course, has now appeared almost two years after that original date. Some companies might not have been so tolerant. "But we've had great support from top management," Rosing says. "You can't just schedule an invention of this complexity. If we'd been forced to sign up to meet a date, we would have had to say, 'No more invention, no more innovation.'"

But surely there was some pressure to produce a product?

"Sure, there were some very tough, brutal moments," says Rosing, "but they were between me and top management. Their concern, of course, was, 'Are we just iterating to make it more and more elegant, and will we ever stop?' I'd try to explain the situation and then come back to the project and change as little as possible . . ."

In addition, Daniels points out, many projects are dictated by specific market pressures—having to get a computer out in order to compete with a similar product. "For us, most of the pressure was internal," he says. "We wanted to get the machine out so people could use and appreciate it, so we'd push ourselves. We'd set 'best-case' schedules."

"Best-case," Tessler adds, "sometimes meant totally unrealistic."

The most depressing period of the project occurred during the integration of all the applications under the Desktop Manager. Completion of a crucial mechanism for allowing the applications to share a programming code took far longer than was expected. "That was about a year ago," Rosing recalls. "We needed a major miracle, and it wasn't there—the project was slipping faster than the calendar." Work continued on polishing the user interface, but, says Rosing, "There are times when you go to top management and say, 'The shipping date has been moved forward again.' And you never know when the boom will drop."

The boom didn't drop, and by the end of July 1982 all the application packages were running simultaneously under the Desktop Manager—the user could easily move from one to the other. It was a milestone, and the generally serious-minded LISA team celebrated with a champagne party. After sufficient champagne had been consumed, a handful of engineers decided to go back to the office and try the cut-and-paste technique that would allow material to be moved between applications. "It wasn't supposed to work yet," Tessler says. "We figured it would take another couple of weeks to get it debugged. But they got it working that night. And since people were still hanging around, we had another champagne party."

After those two milestones, the nature of the software work changed. "Debugging and performance improvement," says Daniels. "That's the part of the project that's not as (much) fun. Getting something up on the screen—that's fun. But spending hours fixing bugs and making things run a little faster—that's not so exciting."

A worst-case analysis

But it was necessary, and it became even more so in light of another event in the life of the Apple company. In the midst of the LISA development project—in June 1980—Apple introduced the Apple III in a version so thoroughly rife with problems that an avalanche of bad publicity ensued. In turn, extra pressure was placed on the LISA team to produce a solid product. By early 1981, for example, 50 usable LISAs had already been built for the software developers. At that point, however, Rosing insisted that the machines be put through a complete worst-case analysis—"timing, temperature, logic-loading, everything," he says. "And then we basically started a redesign." Several more versions were produced in "interim builds," with the design improved each time for factors such as safety and manufacturability. It was not until February 1982 that a LISA close to its current state was produced.

Similar caution went into software testing. "The review process is set up," Rosing says, "so that we *know* there are 1165 bugs in an application as of such and such a date—and that's 1165 bugs that somebody's *watching*, and we *have* to fix."

In a sense, the ideas for LISA's innovative hardware and software developed rapidly in 1980. "The inspiration came quickly," says Tessler. "The perspiration took a lot longer."

One exception was the exact format of the Desktop Manager—the program that provides the environment in which the user manipulates the cursor to choose among applications. There had been early problems with its design, and, to compound these problems, in June 1981 Xerox introduced its Star workstation at a computer show in Houston. The machine was also very user-friendly, and it was heavily influenced by Smalltalk. "A lot of people from Apple went there," says Tessler, "and in a way it was like seeing Smalltalk the year before, in terms of inspiration." The Xerox machine relied strongly on graphic symbols—icons, in the jargon—to organize its functions.

After mulling it over for nearly nine months, the Apple team decided to go with icons as well, which were integrated into the system only at the last minute. The icons are small drawings of symbolic objects—a file cabinet or a wastebasket, for

"Getting something up on the screen—that's fun. But spending hours fixing bugs—that's not so exciting."

example—arranged in a column at the right edge of the screen. Characteristically for the LISA project, even the shape of the icons went through various versions; different artists did renderings, and long discussions ensued as to whether the icons should be graphically elegant or simply as understandable as possible. (Also characteristically, the understandable version won out.) "In a way," says Rosing, "the shape of the icons are like the whole product—you can't point at something and say, 'So-and-so did that; it's all his.' Every part of the system has a lot of people who contributed to it in various ways."

"The mouse, the icons—clearly, Xerox had a lot to do with LISA. And while the (two) products may ultimately be in the same marketplace, the Apple design team reports friendly relationships with the people at Xerox. "I think that they see the fact that we're doing something like their product as giving them more credibility," says Tessler, the former Xerox researcher. "They won't be the only ones on the market with a bit-mapped screen, a mouse, and icons, and so they've encouraged us."

LISA also provided another point of interest within Apple. From the beginning, the LISA project was segregated from the rest of Apple. "The LISA group wasn't designed to fit in," says Daniels. "It was placed in another building, far away from the others. It was supposed to be revolutionary, so it wasn't constrained by having to share older technology." At first—particularly in 1980, when a whole set of new programmers were hired at the same time—the LISA group had a bit of a set-apart, new-kid-on-the-block, privileged image among the rest of the people at Apple. "There was skepticism," Tessler says. "What are all these guys doing in that big building?" But this dissolved rapidly, he says, when the rest of Apple began to see the early fruits of the project. And by now LISA has thoroughly become part of the Apple culture. "After all," Daniels says, "for three years, the sales of Apple IIs and IIIs supported us; now other people are looking forward to us contributing to their research and development."

What vacation?

On a crisp California afternoon, Rosing, Tessler, and Daniels were sitting in a small conference room in one of the two large building now given over entirely to LISA and the personal office system division. They seemed relaxed, but they were clearly looking forward to less intense times. LISA, in retrospect, was a massive project representing more than 200 total man-years in development—compared to 25 for the Apple II and two for the Apple III. And much of that effort went into painstaking software work. "It's probably the largest software project ever undertaken for a single microprocessor on behalf of one user," says Rosing. In scope, it was closer to the kind of effort that produces minicomputers like the VAX—$100,000 machines that serve numerous users at a time.

Bruce Daniels mentions that he has now accumulated his maximum possible vacation time, and Larry Tessler asks, "What's vacation?" But director Rosing is clearly sensitive about this. "*Soul of a New Machine*, the prize-winning book about the development of a minicomputer (Avon Books, 1982)," he says, "created a vision that that's how engineering is done—crazy, intense efforts. But that's partly because in that case, someone else had introduced a product and Data General was behind and had to get out a product to match. We've never had a policy about not taking vacations. People will be working over Thanksgiving, say—the door will be open—but it's up to them. Sometimes during the project two guys would take a machine home and work day and night for a week, but you can't keep that up."

Looking back, it appears that the LISA project produced an unusual kind of group effort—one set up by Rosing to use only as much structure as was necessary. (Neither Tessler nor Daniels can recall what their official titles are supposed to be.) For example, Daniels says, specifications for LISA software started out to be very detailed—50 or 100 pages. By the end, they were brief and informal; the last set, for a terminal emulator, was two pages. "In the beginning, we just knew it was going to be an exciting office product, with graphics, and easy to use. After a year," Daniels says, "everyone agreed on what LISA represented—the next level of subtlety."

"There was no guiding genius," Rosing says, "only a guiding vision, a shared dream." A visitor remarked that it sounds similar to a successful motion-picture crew—during the shooting, no one knows in every detail precisely how the film will turn out. But everyone, from costumer to cameraman, knows intuitively what's right for the picture. "Exactly," says Tessler. "In fact, on LISA, people *had* to have a sense of where we were going, because they were pretty much self-directed for a long time. Some people worked for nearly two years before they saw the whole package play together."

Now, however, the package is put together. In the fall of 1982, sneak previews, mostly for potential corporate clients, had already begun in an elegantly furnished conference room at Apple headquarters, with three LISAs concealed behind an electric screen that moved aside dramatically. Early reaction had been very positive, and the LISA team seemed pleased—although much of their attention was still fastened on last-minute changes and plans for the immediate future. "And of course," says Daniels, "there are those great ideas coming that nobody knows about now—when someone wakes up in the middle of the night with an inspiration."

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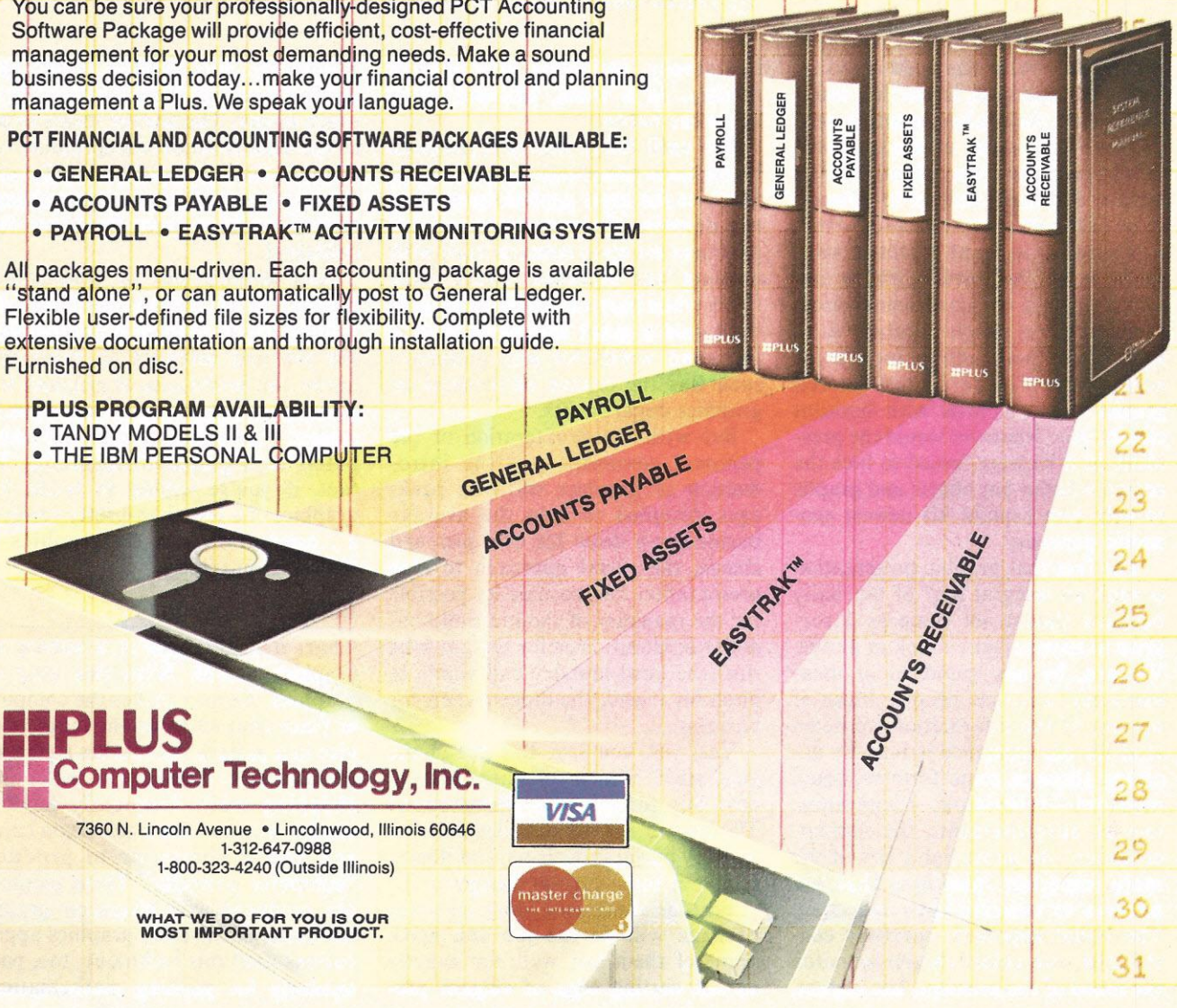

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CIRCLE 35

SPECIAL REPORT

Computer Graphics: The Perfect Visual Message

Creating the graphic that helps sell your product or idea with the most impact is a task best delegated to a personal computer. We'll tell you what you need to know to get started

by David Gabel, Senior Editor

One picture, it has been noted by sage observers, is worth a thousand words. Astute businessmen, sensitive to the value of such truths, caught on early to the potential of the picture and have used it to prepare some of the most sophisticated, artistically satisfying, and effective sales spiels in all the world. Graphs and charts abound in boardrooms across the land. Sales people regularly sally forth armed with nothing more menacing than pie charts and colored graphs to match wits with hesitant clients. And whatever would the president do if he were forced to face the nation without bar charts and graphs to help him explain his newest economic panacea?

The fact that graphic presentation is such an integral part of our daily business should not come as a surprise to anyone but a monk in a cave. We are, by any standard of measurement, a visual people. Most, if not all, of the information we deem vital for our existence is initially accessed through some form of visual medium—television, magazines, movies, advertisements, the computer screen—to name but a few of the more important mediums that use pictures to transmit their messages. The visual approach, carefully constructed with colors chosen to match the mood of the moment, has impact, immediacy, intimacy, and memorability. In a word, pictures bring home the bacon.

But until fairly recently, graphics for business presentations—as well as graphics for most applications—was the domain of an overworked department set up to concern itself with nothing but pictures. There were times when harried executives would have paid a great deal more than a thousand words for any picture—such was the crunch of demand on graphics departments.

But with the proliferation of the personal computer and the introduction of graphics software packages designed to help the average businessman draw his own pies and charts, the visual approach to idea presentation has become as possible for the manager of the multimillion-dollar corporation as for the guy who runs the local laundry and wants to pitch his friend, the diner-owner, for business.

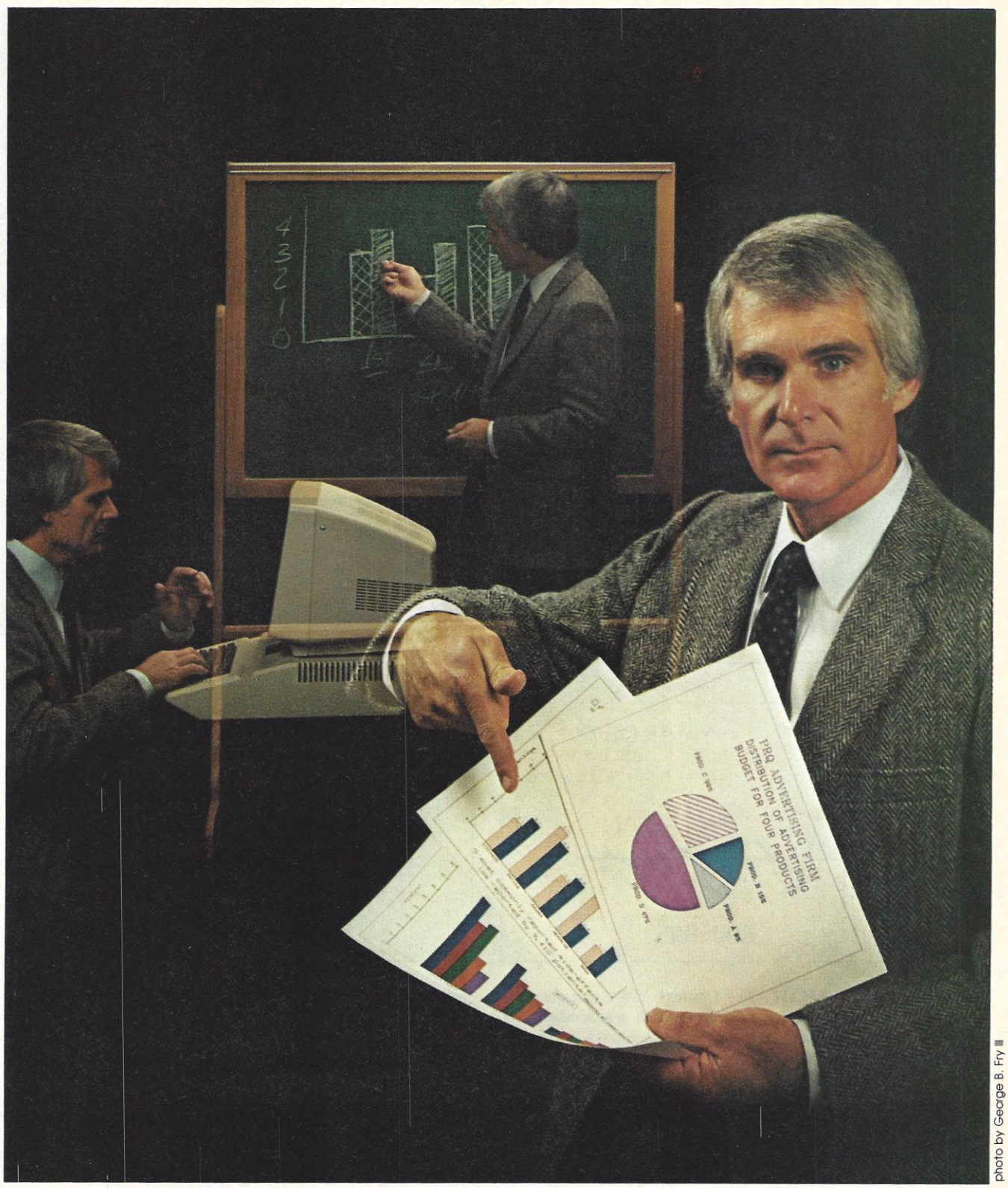
Yes, yes, you say. But get to the good stuff. Which software package do I buy for my own presentation? The answer is simple: It depends. As in every business decision, you'll have to give it some careful thought.

For one thing, not every software package will do the job you need. Some of them are, well, not exactly on the cutting edge of elegant programming. For another thing, the hardware to run these packages is a touch pricey. The answer seems to be in the area of smart compromise—a phrase that, roughly translated, means you get what you want without having to leave your firstborn for collateral.

Any application for computers, personal or not, depends on the availability of both hardware that can do the job and software to drive the hardware. In the case of graphics for personal computers, the hardware is almost a given. Most personal computers have graphics capabilities. In fact, if you're willing to settle for graphics of a less-than-pretty variety, all computers can do graphics—character graphics.

Back through time

Character graphics is a subset of graphics per se. With this kind of graphics, the user makes the computer place characters on the output device in a pattern that makes a picture of some sort. Amusement parks and shopping malls frequently have a vendor who can use a television camera and a computer to produce "computer portraits." These pictures are produced with character graphics. Some of the early graphics applications used this technique, too, particularly for plotting mathematical



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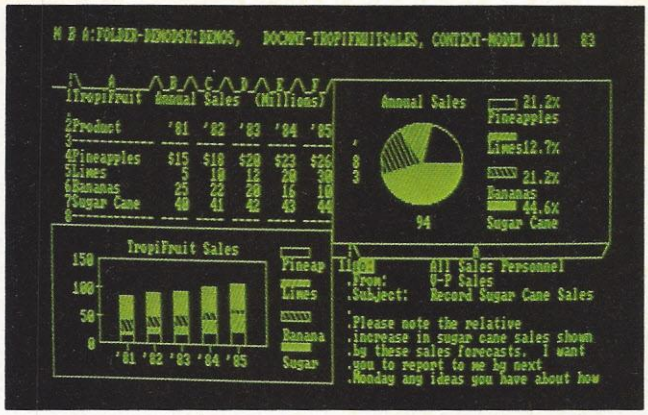
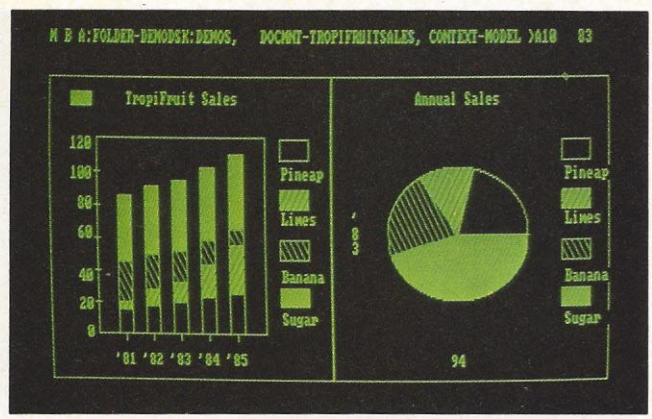
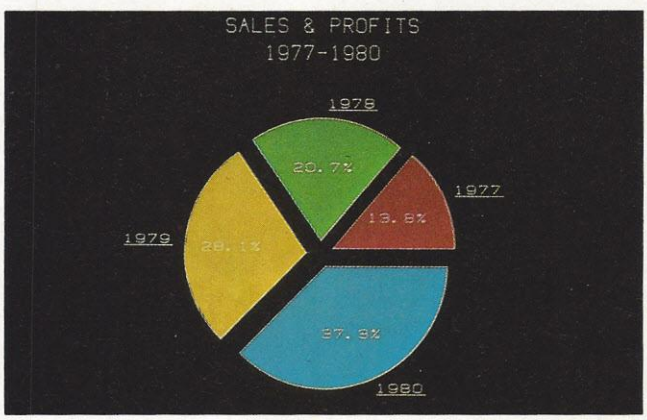
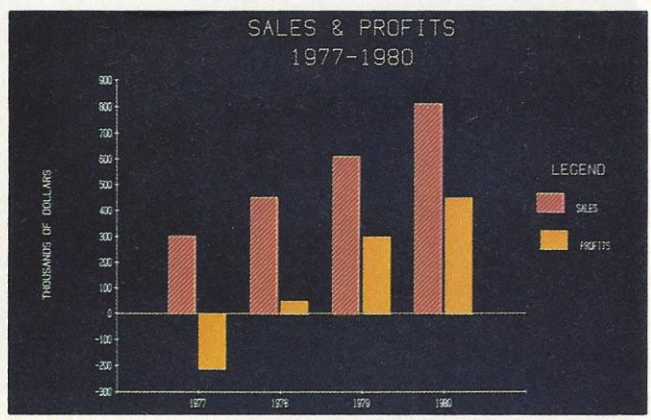
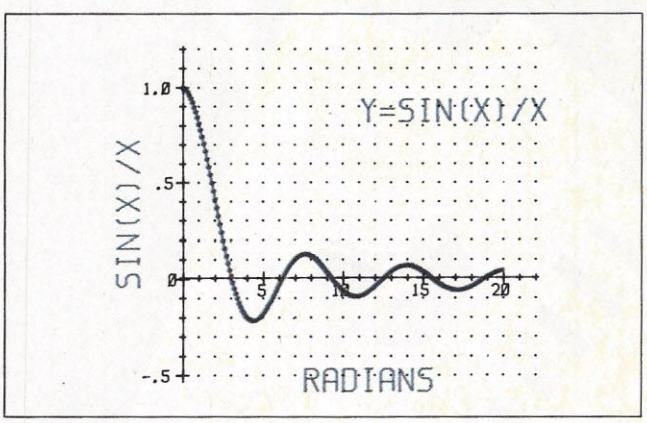
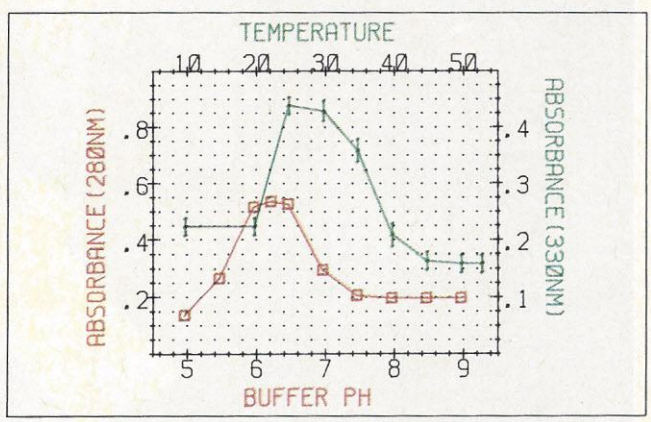












TOP LEFT AND RIGHT: The Context MBA can generate graphs like these from its data base, with which the other functions of the program (spreadsheeting, graphics, word processing, and communications) can interface. A businessman can thus create quality graphics while performing almost all of his daily tasks.

CENTER LEFT AND RIGHT: Business graphics should easily generate pie charts and bar graphs, and allow you to focus on any portion of the graph for greater emphasis. In addition, you may send your graphs to a slide-making service, which will turn them into boardroom-quality slides, like the ones shown in these photographs.

BOTTOM LEFT AND RIGHT: Many graphics-software packages can drive plotters to give better looking output. Plotters have become increasingly fast and exact in their graphics-creation techniques, which are big advantages for businessmen. Interactive Microware's Scientific plotter program drew these graphs on a Houston Instruments HI-PLOT plotter.

A picture drawn on a personal computer is much prettier than one composed of printed characters would be.

functions. The computer simply prints a character in the relative position of the value of the function on the output device—frequently a character printer.

Many personal computers that have been on the market have the capability to address individual pixels (picture elements) on the monitor screen, and the dot-matrix printers that are commonly used on personal computers are also dot-addressable. That means a picture drawn on a personal computer (given the appropriate hardware and software) is much prettier than one composed of printed characters.

Before you can draw those pretty pictures, though, you must know just what you need in order to do graphics. This knowledge is more easily digested if it's broken down into its two main components— hardware for graphics, and software for graphics.

Computers as paint brushes

We've already said that most personal computers have the capability to do graphics, particularly if you're willing to settle for character graphics, as you may have to with most CP/M systems. So there's really no problem in selecting a personal-computer "mainframe" for graphics. Any of them will do; it's just that some of them—the ones that feature bit-addressable graphics and color, such as the Apples and the IBM Personal Computer—will do it better than others. It's in the peripherals that the graphics hardware choices lay.

Graphics peripherals are of two types—input and output. As the classification names imply, graphics-input devices let you get picture information (which can be a description of a bar chart or an animated cartoon) into the machine easily, while graphics-output devices are designed to get pictorial information out of the machine in an easy-to-see fashion.

There are a number of graphics-

CHARACTER GRAPHICS

Even if your computer doesn't have fancy graphics capabilities, you can still use computer graphics. The pictures just don't come out as pretty as they would with graphics commands.

I wrote a program that generates character graphics on the Apple II equipped with an Epson MX-80 dot-matrix printer. The results are shown here. The graph, a sine curve, was printed in the emphasized mode.

The actual plotting starts at line 5000, which I wrote as a subroutine. Theoretically, you could write a driver program that would call the plotting subroutine from a variety of locations. Subroutines are helpful in those circumstances.

The basic idea is to generate a character array that's filled with blanks, except where you want the plotting symbol (grid lines or axes). You then fill the plotting array with the characters of your choice and print it.

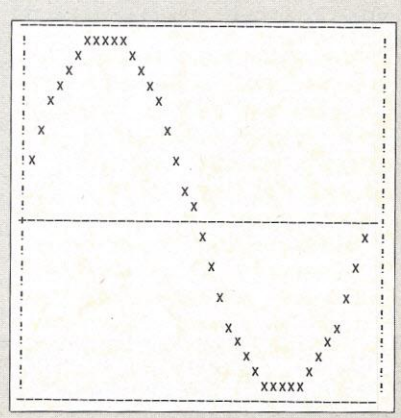
I had to do a lot of fiddling to get the Epson to understand what I wanted. This routine probably isn't the most efficient way to get this done, but it worked. There are a lot of things you could do with this program. You could make it interactive and have the computer ask for data points to be input; make it plot more functions; or do pie charts or bar charts, filling each pie wedge or bar with a different character. There are other possibilities, too. You could, for example, decide that you wanted to do more than one plot on a particular graph. Perhaps the simplest way to handle this choice is to have an array of plotting symbols (like asterisks, plus signs and the like), and select the proper plotting symbol depending on which function you're plotting. Adding a grid is accomplished by deciding what symbols are to be used for the grid, and then telling the computer to print those symbols at the appropriate points. You do this in the main loop that contains the print statement that does all the character printing.

Refinements like this take time and effort (yours) of course. You may find that the time it takes isn't worth the fairly poor quality of the graphics you get. That's what happened to me. I could have made this little program do much more, but I had to settle for less than the ideal because time began to weigh very heavily. So I had to reduce the design of the program to the point where all I wanted the thing to do was calculate some data points, stuff them into an array, and print the result. If you're so minded, go ahead and improve it. If you're not, then just consider this an example of character graphics.

```
]LIST

1000 D$ =  CHR$ (4)
1010  DIM PT$(40,24),PT%(40,24)
1020 PS$ = "X"
1030  FOR X = 1 TO 40
1040 YT = 12 *  SIN (.157 * X)
1050  IF (YT = 0) THEN Y% = 12
1051  IF (YT = 12) THEN YT = 0
1060  IF (YT > 0) THEN Y% =  - (YT - 12)
1070  IF (YT < 0) THEN Y% = 12 + ( - YT)
1075 PT%(X,Y%) = 1
1080  NEXT X
1100  GOSUB 5000: END
5000  REM  PLOTTING SUBROUTINE
5001  PRINT D$;"PR#1"
5002  PRINT  CHR$ (12)
5003  PRINT "----------------------------------------
5010  FOR Y = 0 TO 23
5015  FOR X = 1 TO 40
5020 PT$(X,Y) = " "
5021  IF PT%(X,Y) = 1 THEN PT$(X,Y) = PS$
5022 PT$(1,Y) = "!"
5023  IF (Y = 12) THEN PT$(X,Y) = "-"
5025  NEXT X
5030  NEXT Y
5031 PT$(1,12) = "+"
5090  FOR Y = 0 TO 23
5091  FOR X = 1 TO 39
5100  PRINT PT$(X,Y);
5101  NEXT X
5102  PRINT PT$(40,Y);"!"
5110  NEXT Y
5111  PRINT "----------------------------------------
5115  PRINT D$;"PR#0"
5120  RETURN

]PR#1
]PR#1
]PR#0
```



Software has to decode the information sent by the trackball to decide what the user wants to do.

STROKERS

Most monitors and terminals used with personal computers employ raster-scan technology. There are two reasons for that—cost and color. Raster-scan technology is well-known, and the components required for it are produced in volume. Also, the technology isn't terribly demanding of the components, so manufacturers can build in good resolution without too much cost.

Raster-scan technology also lends itself well to color output. It works on the same principle as does color TV, but the colors are generally better on digital monitors. Better, in this context, means sharper and more vivid.

There's another kind of technology used for computer graphics called vector-refresh graphics. A display terminal that uses vector-refresh technology is called a stroker. Whereas raster-scan monitors sweep the electron beam from side to side on the screen, turning it on or off to illuminate a dot, vector-refresh products draw lines directly; the beam starts at the upper-left corner of the screen, say, and goes directly to the lower right, leaving a line wherever it was.

This makes a much better display because the line is completely straight. Spend any time at all with a raster-scan terminal or monitor and you quickly see that diagonal lines become jagged. That's because the position at which a dot should be printed, or, precisely, illuminated on the screen is a piece of digital information. It can't be "about scan line 52"; it has to be exactly scan line 52. If the position calculated for a point is 52.3, the computer has to choose whether the position it will use is 52 or 53. In other words, the computer will either round or truncate the position information it receives for a dot, and tries to get the best fit of the dots to the line you thought you were going to draw. So some of the positions actually used will be above the line desired, and some will be below. The result is a line that's jagged, and the less resolution the computer's monitor has, the more jagged the line will be. Aliasing is the term used for such jagged lines, which can be corrected in software, provided there's enough resolution in the monitor.

The problem with vector-refresh graphics is the short lifetime of the phosphor illumination. After the beam has drawn its line, the image will fade. Because of that fade, the beam has to come back and draw the line over again; it has to refresh the image. The more lines on the screen, the harder it is for the beam to get back to them and refresh them. This leads to flicker of the image; the number of short vectors a terminal can draw without flicker is a measure of the quality of such terminals.

Vector-refresh terminals have to be precise and fast, which is why they cost tens of thousands of dollars.

There is another vector technology—called the Direct-View Storage Tube—pioneered by Tektronix, of Beaverton, Ore. This draws with vectors, like vector-refresh terminals, but its screen is coated with a bistable phosphor. If the phophor is hit with a beam of sufficient intensity, it goes into what's called storage mode where it retains the image indefinitely, provided the screen is supplied with a "flood" of low-energy electrons. Flooding the screen with higher-energy electrons flips the phosphor back into its other bistable position, unilluminated.

Vector tubes are monochrome by nature. They can be made to produce color with a beam-penetron scheme. In this scheme, the tube face is covered with layers of different-colored phophors. The electron beam can be energized to different levels, and different energy levels will illuminate different phophors. Such tubes are included in very expensive systems that run in conjunction with minicomputers. Strokers, which are also the kinds of displays used on video arcade games like asteroids and space invaders, are principally used in computer-aided design.

input devices. In addition to keyboards there are joysticks, trackballs, mice, digitizers, and light pens.

Each of these devices is specially designed to make graphics inputting easier. Their applicability is a function of the graphics data you want to employ.

The keyboard is the most familiar graphic-input device. It's also probably the most tedious to use, because when you use the keyboard, you can only input data that the software will work on, or you must input the graphics instructions themselves. Still, it's the most familiar computer input device we have today. Consequently, some graphics packages, such as PFS: Graph by Software Publishing (Mountain View, Calif.) require only the keyboard for input—they handle all the graphics work internally. The user simply inputs graphics options and data, and the computer does all the work. This kind of total system, therefore, may be the easiest kind of systems approach to personal-computer graphics, despite the tedious nature of the input device.

A joystick is simply a cursor control device with a handle sticking vertically out of its top, that has buttons for additional functions. Joysticks are used to indicate the direction that a graphics cursor should move on the screen. There are two kinds—on-off and proportional. On-off joysticks contain four switches. Moving the joystick up closes one of the switches. The computer, sensing this switch closure, makes the cursor go up on the screen. Right, left, and down motions are accomplished in the same way. Moving the cursor makes the cursor move in the appropriate direction because the computer senses how many switches have been closed. Appropriate software has to decode what the user meant by closing the switches. The information received from the on-off joystick found in popular machines like the Atari 400 and 800 by Atari (Sunnyvale, Calif.), and the VIC-20 by Commodore (Wayne,

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CIRCLE 37

Many plotters will draw directly on overhead transparencies to give a presentation a professional look.

WHAT'S A GRAPHICS PACKAGE LIKE?

It's all very well and good to talk about all the things you can do with a personal computer and graphics software. But just how do you go about doing those things? What is it really like?

With some packages, generating business graphics is really easy. They're designed specifically for that purpose, and they make it simple to input the necessary information and get the graph out.

However, these packages won't do anything but business graphics. So if you want to be able to draw pie charts and bar charts plus a replica of the Mona Lisa, you need to go for a graphics package that has more capabilities than just business graphics.

Be aware that you could have a problem in wanting so much versatility. I tried a graphics package that has a lot of capabilities. This package says it requires some kind of electronic drawing implement for its use. So I bought a pair of game paddles. They're a lot cheaper than a joystick, and I soon found out why. Controlling a cursor is almost impossible with game paddles. They're OK when you try to move the cursor up and down or left and right. But just try to get a straight diagonal line. It's like trying to get a straight diagonal line with the old Etch-A-Sketch children's game that has dials on the bottom of the screen—almost impossible.

In fact, I found that this particular program took a long time to learn. That's because it has a lot of functions that interact with one another, and you just have to learn them. If you're satisfied with business graphics—pie and bar charts, and line graphs—stick to a business-graphics package.

One such package that I tried is PFS: Graph, by Software Publishing Corp. (Mountain View, Calif.), for the Apple II Plus. I decided to try to make a bar chart of the sales of a mythical company for a year. I found using the PFS program simple and straightforward. In fact, it was so easy that I did two graphs. One was a simple, single-variable bar chart, showing sales of the mythical Acme Company. The next one showed the results versus goals of the sales effort of the company, divided into two regions. (The chart is included here.)

When you boot PFS: Graph, you are confronted with the main menu, which lists six options. When I did the second graph, I was already familiar enough with the menu to go right to the Define Chart option, where I specified the graph I wanted to do. Then I went back to the main menu (PFS: Graph always returns to the main menu) and got to the Enter/Edit Data option. With this function, a table appears on the screen; you are expected to enter your data, using the forward arrow to move to the next data item as soon as the one you're working on is done. When I was done entering data for Graph A, I simply hit CNTL-C to get back to the main menu.

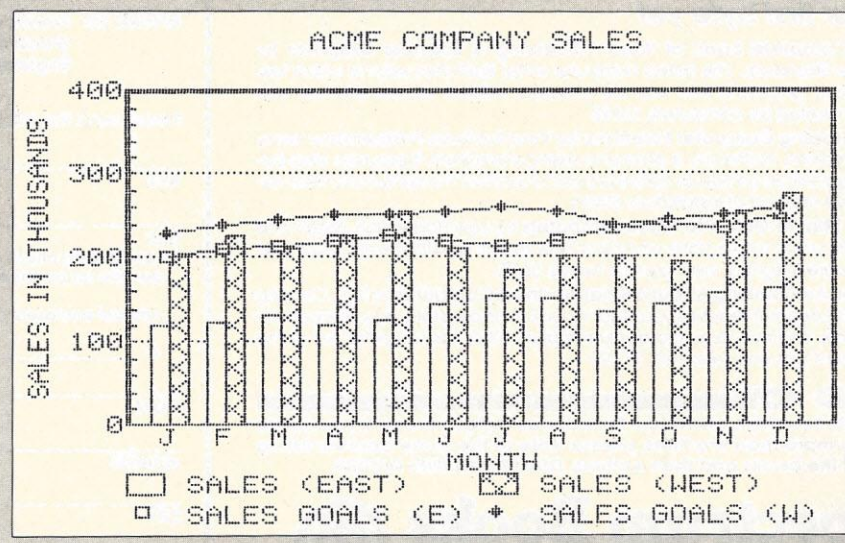
Once I was there, I chose Display Graph; in about 10 seconds Graph A appeared on the screen, scaled, with axes labeled as I had defined them in the Define Chart option.

I then entered data for Graphs B, C, and D, looking at the results on the screen after each data set was entered. When I finished them all, I realized the line graphs were down in the middle of the bar charts. Their position would be OK if I were constructing an actual business graph, but I wanted to show them for the purpose of illustration. I went back to Edit Data and added 100 to each of the values in Graphs A and B so the line graphs would be easier to see. Then I displayed the chart again to make sure everything was OK.

Printing is the only thing that takes a long time with this program. I printed, using both normal-size and expanded-size graphs. Since the printer is operated by firing individual pins, and since the paper advances only in small increments, it seems that the printing is proceeding at a snail's pace.

Printing also gives you the option of listing the data prior to printing the actual graph. If you choose this option, you then have the further option of aborting the plot. That's a nice touch for those people who see something that's not right in the data and don't want to waste their time printing a graph that wouldn't be right in any case.

Here's the bottom line. In about 45 minutes I produced a four-variable chart, using line and bar graphics, with the right sizing and labeling. Try getting the graphic-arts department to do that!



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CIRCLE 31

If you want to pick an object, you point the light pen at the object, and the pen tells the computer where it is.

Pa.) is binary in nature. Either the user wants to move the cursor or he doesn't.

Proportional joysticks, on the other hand, can tell the computer how fast the user wants the cursor to go, because they sense the relative position of the handle with respect to the neutral position. This information is decoded by an analog-to-digital (A-to-D) converter (like the Apple II's game-paddle port), and then supporting software decodes the digital information from the A-to-D converter and decides what the user wants to do. Proportional joysticks provide a slightly finer control of cursor position than on-off joysticks do.

A trackball has a ball but no track. It's a device that has a large ball mounted in an enclosure that covers all but a small portion of the ball. The user rolls the ball in one of four directions in its mountings, and the trackball's electronics keep count of the number of revolutions of the ball in any particular direction, assigning a given number of electronic pulses (analogous to bits) to each revolution. As with the joystick, software has to decode the bit train sent by the trackball to determine what the user wants to do. Then the software moves the cursor on the screen in accordance with the relative rotational position of the trackball.

A better mousetrap

The mouse—a palm-size device with a small trackball on the bottom—is a graphic-input device that's gained a lot of attention lately. A user rolls the mouse around on the desk surface, and the ball keeps track of the mouse's relative position in much the same way that a trackball does. The cursor moves on the screen in relation to the relative position of the mouse on the top of the desk. Mice are being used in the new generation of computers that are becoming available (the Xerox Star, Apple's new LISA) to give users easy access to the computer's functions. The user simply moves the mouse until the cursor is over the menu item he wants, and then presses, which picks the item and sends the computer to do what the user wants it to do. Software deciphers the position of the device and determines what the user wants when he pushes the buttons located on the mouse.

Digitizers are like drawing boards. The difference is in the form of the output. A drawing board's output is on a piece of paper. You draw on the paper and pick the paper up when you've finished the drawing. A digitizer's output is electronic pulses that relay the position of a pointing device on the digitizer's surface to the computer, which stores those locations in memory. Pointing devices are generally of two types—one that looks like a gun sight, and one that looks like a pen. The gun-sight carrier has buttons on it that allow the user to enter commands. For example, the user might want to pick an item that appears at a particular point on the screen. Moving the carrier to the position that puts the cursor over that screen point, he presses a button, and the item is picked. With a pointing device that looks like a pen, he simply puts the pen on the appropriate point and presses. An internal switch tells the computer that the point has been picked, and the computer performs the action its software tells it to do.

Using a digitizer is a very simple operation. Depending on the supporting software, a lot of things can be done quickly. It's a real experience to move that pointing device around on the surface of the digitizer and see movements recorded on the monitor.

Write with light

Light pens don't really draw with light. Rather, they sense the presence or absence of light (or in some types the presence or absence of the CRT's scanning electron beam) and relay the position information of the beam to the computer. To pick an object, the light pen is pointed at the object, and the pen relays the presence of light at that location when the light gets there. This means that the computer has to move a cursor over the screen, keeping track of the cursor's location, until the cursor passes under the light pen. Or the computer has to translate the motion of the electron beam in the CRT to the location of the light pen when it senses the position of the beam.

When in doubt, draw it out

Once the graphic information (the position data and commands, such as draw a line from point A to point B, or draw a bar chart with the data supplied) is in the computer, it has to be displayed in some way. There are several output devices that accomplish this feat. They include printers, plotters, and graphics monitors and terminals.

There are a number of printers that can accomplish graphic output. These are, in general, printers that have dot-matrix output, or ink-jet printers that use streams of charged ink to draw on paper. The drawing can be either fully formed characters or dots. Character printers can, of course, be used to draw character graphics (see the sidebar Character Graphics on page 99).

Most graphics printers can only draw in black and white. This may be all you need. Color is useful for clarifying a drawing that has a lot of information in it, but many applications don't require color. If your applications don't, look askance at color printers, because they're quite expensive.

Once the information is down on paper, it can usually be converted to overhead transparencies. Many firms have a machine which does just that. The document plus a sheet of plastic are fed into the machine, which burns the image of the document onto the plastic. Voila—instant presentation graphics.

The printer has to be supported by the software running in the comput-

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CIRCLE 39

The keyboard is the most familiar graphics-input device, and probably the most tedious to use.

er. Many printers support graphics screen dumps (the dot images on the screen are mapped, one for one, to the printer), but such printers may require a special interface on some computers. Make sure your printer has such an interface, or that you can get the appropriate software for the printer, or that the graphics package you have in mind will dump graphics to the printer you have with your system.

Color is something else. Some personal computers are terrific at throwing a color picture up on the monitor screen, but there isn't a really low-cost, hard-copy, color-output solution yet. The latest low-cost pen plotter from Hewlett-Packard, the HP 7470, seems to be the one most talked about right now.

Lacking a pen plotter, you might opt for a four-color printer. Four colors are all that are needed to make up any color in the rainbow, so such printers use four ribbons (sometimes three, if black is deleted) to manufacture other colors. The three or four ribbons add to the complexity of the printer, of course, and make the printer expensive. The other problem with color dot-matrix printers that use ribbons is that the color is usually not very brilliant. Then, too, three-color printers generate black by overprinting the three colors—red, blue, and yellow—which yields blacks that look more like mud than lampblack.

There is another solution. Printacolor Corporation from Norcross, Ga., has a color ink-jet printer. This device, which sells for $4995, prints color graphics quickly and easily, the company says. Its price, while high, is about half that of printers that use three- or four-color ribbons.

You can't get color-printer output onto overhead transparencies easily, and that brings us back to the subject of pen plotters.

Plotters do a good job of presenting line drawings in color. Many of them will plot directly on overhead transparencies to give a presentation a professional look. They come with a bewildering variety of options; the more options, the higher the cost. The HP plotter will plot in four colors with resolution sufficient to handle most charts and graphs of the kind businessmen want, and there are many other competent plotters on the market as well.

Pen plotters plot with a series of straight line segments. If you want to draw a curve, you use lots of short line segments at varying angles. The more line segments you use, the less segmented the line appears. Also, the more line segments you use, the slower the plotter goes. For most business graphics, this isn't really a problem—unless your chart has a lot of letters. Letters are made up of small line segments, too, and their drawing speed is, therefore, quite slow. But that may be a small price to pay for color pictures drawn directly on mylar for overhead transparencies.

There's one problem with both pen plotters and dot-matrix printers used for graphics. They're slow. It seems to take forever to get a drawing done if you're used to the speed of a dot-matrix printer pumping out characters.

The video connection

Most personal-computer users are familiar with the video monitor as a graphics output device. It's usually the first output device, even if you have a plotter or a printer. You can do charts, graphs, and drawings on the monitor, and modify them over and over before you have to commit to paper.

In "Monitors: The Better To See Your Data With" (*Personal Computing,* December 1982, page 112), raster-scan monitors are discussed. These plus raster-scan graphics terminals are the most common types used with personal computers, because they're inexpensive compared to vector types. (See also the sidebar Strokers on page 100.)

We won't get into video-output devices here except to note that graphics terminals are beginning to come down in price. They have a long way to come, as evidenced by the recent introduction of the Graphos terminal from Ithaca Intersystems (Ithaca, N.Y.), which ballyhoos its low-cost product with a price tag of "under $8000 in single quantities."

That price is high because the terminal, and others of this genre, give very good resolution for graphics. They accomplish this resolution by putting in a lot of memory and by having very sophisticated screen-control electronics and graphics software. Still, they need application software to be able to do any meaningful graphics. In this as in other applications, software is the controlling factor.

It keeps on getting easier

It wasn't too long ago that people who wanted to use computer graphics almost had to be computer programmers. The software for graphics generation consisted of sets of primitive commands the computer could understand, but the software took a lot of time and effort on the part of the casual user. Faced with the lack of easy-to-use software, most businessmen and managers opted to leave computer graphics to the computer types while they got on with their jobs.

But companies that publish personal-computer software have made their livings by bringing capabilities to businessmen that those folks didn't have before. Graphics is beginning to be one of those capabilities.

In the past, most personal computers had access to graphics through the computer's BASIC language. Commands in BASIC, like DRAW and COLOR, allowed anyone with patience—and lots of it—to build graphic shapes on the screen and even to dump the images to a printer (assuming they could program the commands the printer needed to plot

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Color is useful in clarifying a drawing that has a lot of information in it.

what was on the screen). If you're a person who gets a kick out of making the computer respond to your every whim, you can still do that, provided the BASIC your machine runs will accept the graphics commands. And even if it won't, you could use character graphics to create a host of charts, graphs, and pictures.

Most will opt for the graphics-software packages that are becoming more common. Examples are VisiPlot/VisiTrend, from VisiCorp (San Jose, Calif.), PFS: Graph, from Software Publishing (Mountain View, Calif.), and Apple Business Graphics from Apple Computer (Cupertino, Calif). Other packages are mentioned in the buyer's guide on pages 108 and 109.

Packages like these make business graphics easy. Typically, you just type in the information you need, and the computer gives you the graph you want. The graph will be of good enough quality for most of the presentations you want to give, and it will certainly be of sufficient quality that you can use it yourself to spot business trends and the like.

Caveat emptor

There are several things you should consider if you're thinking of getting into graphics. The first, and most obvious, question is whether your computer is capable of displaying good, quality graphics. If it is, you're in business.

Then you have to consider the application. Will you want hard copy? You probably will. Video monitor graphics are great, but it's not likely that you'll invite a meeting group into your office to look at the latest figures and then cluster everyone behind your back so they can see the screen on your computer.

There is a way around that. You can get a projection TV and put your graphics on that. It's good enough for large-crowd viewing. Or you can remote connect several monitors from one computer and scatter those monitors around the meeting room. Or you can opt for one of the services that makes 35-mm slides from your computer graphics. Finally, you could get one of the software packages that turns your computer into a slide-show machine and then connect the monitors as we said before.

If you don't go with any of these alternatives, you'll probably need a printer or a plotter—one that your software package will support. Most packages list the hardware as well as the input devices they support in their user's manuals. Some packages only require a keyboard for graphic input, others require one of the other devices we discussed earlier. But don't try to use one of those devices without one of the supported graphics input devices. It won't work.

What should the software do?

For most business applications, the software should be capable of presenting line graphs, bar charts, and pie charts. In addition, the line graphs should be capable of displaying four lines. That's the opinion of John Page, vice president of engineering for Software Publishing Corporation. Not surprisingly, his company's graphics package has all those capabilities. Other packages from other vendors might have these capabilities and more. They might, for example, have some analysis capabilities built in, be able to display a scatter plot, support different kinds of color and monochrome printers, or store information so that the plot is easily delivered to one of the slide-making services.

One thing that Page and Ed Esber, product manager at VisiCorp, both list as essential in a business-graphics package is the ability to understand time. Most business charts require that some variable of interest (sales, for example) be plotted against time to see expected growth and variations. If you have three points—January, March, and June, for example—the package should insert spaces where missing data points are. Otherwise, the graph won't make a lot of sense.

Another useful feature is the ability to use information stored in files created by other programs. VisiCalc is one such program. It's a lot easier to see what's going on with a large, complicated model you created on VisiCalc if you can plot the information of interest. Many packages will support such data files from other packages.

One such combined package is the MBA from Context Management Systems (Torrance, Calif.). This is one of many packages appearing, or soon to appear, that incorporate graphics with other functions businessmen need. Such functions include data-base management, telecommunications, word processing, spreadsheeting, and others. Context's product lets you take information from the common data base and include it in text output or graphics output on the IBM Personal Computer. The output can be on the screen (optionally using screen windows, which are separate work spaces on the CRT) or on a printer. Other such packages will no doubt proliferate as more computers appear that will support the memory requirements of such a sophisticated program. Some others are listed in the buyer's guide.

You probably can't justify the cost of the purchase of a personal computer with the graphics option. You didn't do graphics before, and there's not likely to be a good argument to convince the boss to spend the money a computer costs to give you that capability. But it is something else you can do that makes the personal computer a valuable tool. The small computers will give graphics suitable for most of the applications you'll want it for. And as Ed Esber says, "Even if you have to make a presentation in the boardroom, you'll at least have good drawings that you can take to the company's graphic-arts department."

"No, we're all okay, but our computer's gone."

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Luckily, all that was missing was the computer and some spreadsheet software. And that should be covered by insurance.

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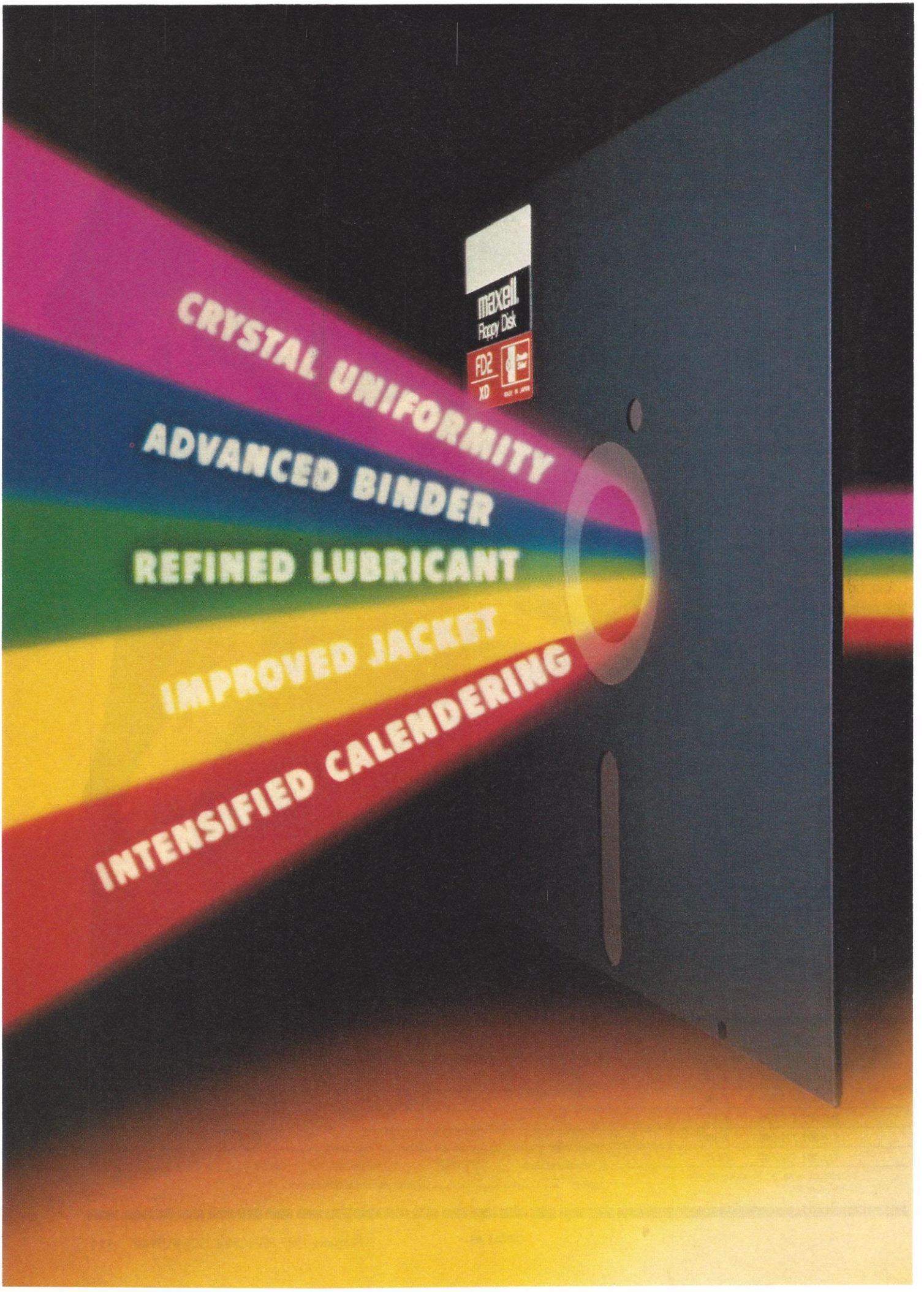
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CIRCLE 43

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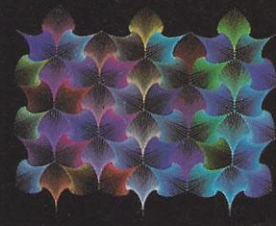
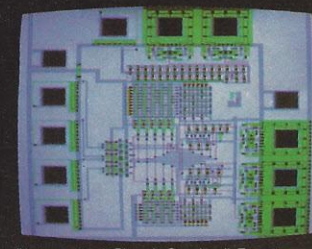
"*Three Atoms*" Courtesy of Greg Abram, University of North Carolina at Chapel Hill



"*Aurora*" By Richard Katz, Vectrix Corporation



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CIRCLE 44

Logically Designed Logic Software

New software is allowing engineers to use personal computers for the design of logic networks. Not only that, this same software allows simulation runs that have other—diverse—applications

by Lee Thé, Associate Editor

One of the givens in the world is that technological advances happen at a rate just slightly behind the speed of light. Hardly do we have time to digest one, when another miracle of technology comes wheeling in like a Greek oracle, clamoring that there are plenty more where it came from and they're all just around the corner. And indeed, there generally are more developments just around the corner. You could set your watch by their rapid appearance.

The phenomena of the speed of technological breakthroughs and advances seem especially fast-paced when the subjects are computers and software. In the last two years alone, incredible strides have been made in bringing personal computing within the reach of an ever expanding spectrum of the public.

Software is being sold which is the stuff of yesterday's science fiction. Programs are on the market which will make a computer do everything from balance your checkbook to design your own version of the brave new world. There are programs that allow you to play with numbers of the kind that would have made Einstein's eyes water.

Yes, yes, you say, but what's the point?

Well, have you ever wondered why these advances in computer technology happen so fast—and why their speed seems to be increasing?

There are, of course, reasons—several reasons—for this.

Computers differ fundamentally from calculators in that they have, within their innards, circuits which give them the capability to perform logic functions. Calculators can only add, subtract, multiply, or divide. Computers, however, can make choices. Without that logic capability, the slightly sarcastic sobriquet of number cruncher would be drearily apt. Enter here the logic network design engineer.

Logic network design engineers are the people who make computers do what they do. The speed with which they can now get their jobs done, thanks to personal computers, is directly proportional to the speed with which technological advances show up in the marketplace. The perception of an ever-increasing rate of development is directly related to the fact that these same engineers are now literally using personal computers to design their own logic networks. It is a far cry from the way it used to be.

The way it used to be

In the recent past, design engineers were under a bit of a strain. Time was of the essence, products had to get out as soon as possible to beat the other guy's product to market—but there were some primary consumers within his own organization who also required attention.

In a hypothetical case, such primary consumers as marketing people might be something less than discreet in declaring that any new logic network had better be state of the art, or it wouldn't sell. Accounting types could wonder aloud whether or not the engineer was swift enough to know the thing had to be made at a cost which would allow them to leave him an expense account when they made up the next budget.

The manufacturing department could explain that if the network wasn't easy to make, they'd have to explain to higher-ups that it was a dumb idea and would very likely cost the company its shirt. And the service people might leave him with the impression that he'd better check with them on whether or not anybody would be able to get the network fixed in the event that *his* design had some bugs in it.

Against that background of diversified special interests was the problem of designing the network in the first place.

In order to work on a logic network design, an engineer had to bread-

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Have you ever wondered why advances in computer technology happen so fast—and why their speed seems to be increasing?

COMPUTER LOGIC IN PERSPECTIVE

To understand the tools and tasks of digital-design engineers, it helps to think of computer logic in concentric shells. The outermost layer represents the highest level of abstraction, in which one act or event is the sum of a number of events not directly visible. With some simplifications, the layers are: application software programs, higher programming languages, machine language, logic networks, circuit design, and topology design.

Someone working with a word-processing program can type CATALOG on his keyboard and thereby ask the computer to tell him what's on a disk. That command is part of a logically organized "universe," where the user can be confident that a given act will have a given result—a fundamental test of logic.

The command CATALOG is usually executed by a string of programming-language commands that reside in the application program, but are invisible to the user. A programmer will work at this level. Each command a programmer writes in a higher computer language, however, is executed by a string of machine-language commands—arrays of ones and zeros, which are the only things a computer understands. A machine-language programmer will work directly with these binary arrays of numbers. But each machine-language command is, in turn, executed by networks of logic gates built into the hardware of the computer's microprocessor, associated, and integrated circuits.

Each logic gate takes one or more binary inputs, and then produces one binary output. An AND gate outputs a one, only if all its inputs register ones simultaneously; an OR gate outputs a one if any of its inputs register a one; a NOT (INVERTER) gate outputs the opposite of a signal coming into its single input, so it outputs a one if it receives a zero signal. NOR, NAND, and EXCLUSIVE/OR GATEs are variations of these gates.

The gate's output either goes to a memory location (called a flip-flop because it stores a one or a zero according to its most recent input); to another gate; or out of the microprocessor to act on another part of the computer. Memory locations are grouped into REGISTERS, and the logic design generally acts on memory locations in these aggregates.

It may take the action of hundreds of logic gates to execute that simple CATALOG command we started with. And a microprocessor will contain from 4k to 10k gates networked together, all obeying the rules of Boolean logic.

Each logic gate is connected by an electrical circuit node. Each node may have an infinite number of elements connected to it. The logic gate's decision-making is enacted by carefully timed signals of specified strength flowing through the network. So where time and power level mean nothing to the digital logic layer, they are very important to the electrical circuit layer that enacts that logic.

While logic circuits can be implemented by wiring up breadboards with discrete transistors, transformers, etc., those are much too bulky and expensive for anything but on-off designs and testing. Logic circuits are usually built into ICs that plug into the computer's printed circuit boards. Each IC contains thousands of circuit nodes built into multiple layers and regions of silicon-based IC chips. The topologist drafts the physical layout of the chip's internal circuitry, and the ability of your computer to execute that simple CATALOG command rests on the topologist's draftsmanship.

board it—which meant that he took a piece of material something like a pegboard, and painstakingly built a working model, complete with all of the circuitry. It was a reasonable—if time-consuming—way in which to study a piece of hardware that, should it work, would later be reduced to the size of a tooth filling. The alternative was batch processing.

Batch processing—which means submitting work to a mainframe for testing and simulation runs—was, from the point of view of a man up against a deadline, something less than efficiency's finest hour. For one thing, unless his project was coded in some way to tell the mainframe to run it first, he could spend no little amount of time cooling his heels as he waited for his work to be done. The mainframe, in the absence of a code, simply processed work on a first-come/first-served basis. And, if the design had a bug in it, and hung up the mainframe, the computer simply rejected the entire project.

Time changes things, and so it has changed the logic network design engineer's lot. For one thing, he can now—thanks to some slick software—do his job on a personal computer. What this means is that he can run one simulation after another—until he gets it right. True, his personal computer will run the simulation more slowly than a mainframe. Nevertheless, he'll get his work back long before a mainframe-dependent engineer's job will be returned. Of course, no engineer worth his salt would submit a design for manufacture without, as a final step, making a model. In the perfect world of computer simulation, everything works the way it's supposed to work. In the imperfect real world, where manufacturers' tolerances sometimes tend to drift, the final test of an idea is to make a prototype and see if it flies.

The joy of personal-computer-aided logic design comes from software adapted especially for that purpose. Fortunately for the weary

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The joy of personal-computer-aided logic design comes from software adapted especially for that purpose.

A LOGIC SIMULATION PROGRAM

The Learning Company (Portola Valley, Calif.) has created Rocky's Boots, the layman's counterpart of engineers' logic network simulation programs. The program teaches how digital logic works, and provides the digital equivalent of an Erector Set. After users learn how the components function and how to manipulate them, they can assemble the components into any network.

Users are given eight parts to work with: power sources, one of which he can move around; gates, such as NOT, OR, AND; output devices, such as rocket engines, kicking boots, and clackers; wires, with sockets and plugs; sensors, which are reactive to different color power sources; memory, which are flip-flops and delays, or D-flip-flops; clocks; and a knife.

These devices are found in a series of connected "rooms," or screens. Users can enter and leave the rooms by moving a mobile power source through doorways at the edge of any given room. This makes it possible to get at a large, multiscreen work space.

But does the program provide more than entertainment? Spectrum Software (Sunnyvale, Calif.), purveyors of engineer-oriented logic design software, says that the game provides an introduction to the basics of logic design and to the idea of transfer functions. "The functions performed are identical to the functions performed inside a (personal) computer," says Andy Thompson, president of Spectrum. "Rocky's Boots teaches you the basic structure of Boolean logic and does it in an entertaining way."

The gap between Rocky's Boots and Thompson's software is in the area of network design. Thompson says that Rocky's Boots doesn't really teach network design—but it's a great start. It gives adults and children a sound introduction to computer logic fundamentals.

engineer, some very good programs have appeared. The best known are Logic Designer and Simulator Program, and Microcomputer Circuit Analysis Program. Both come from Spectrum Software of Sunnyvale, Calif. Andy Thompson, Spectrum's owner, is a man who understands both software and hardware; he formed his own company after 12 years at AMI, where he was director of engineering. Spectrum Software's simulation programs reflect the expertise that could be gained only through that kind of background.

Thompson's Logic Designer and Simulator Program works in two modes—graphic and text. The graphic mode allows designers to use keyboard commands to sketch a network of logic gates onto an on-screen simulated breadboard, complete with symbols for each function and its pin connections. (A logic gate is the bit of circuitry that allows you to program in a choice.) The Microcomputer Circuit Analysis Program lets the designer check digital networks visually, before they're turned into simulations and run up the flagpole, as it were. Up to 77 logic gates can be simulated per single screen image, and up to six pages per simulation. What all this means is that an engineer can have an many as 462 logic gates in his network, which the program will then convert into a net list of all the logic gates, plus their pin connections. The entire list is then run in simulation to make sure the whole circuit works like he thought it would.

In the second mode—text entry—the design engineer enters a net list directly. It's harder to do, but it does have the saving grace of allowing simulations of even larger networks.

According to Thompson, most of the users of his Logic Designer and Simulator Program use it in the graphic mode to design networks as small as ones containing only a handful of logic gates, to those with several hundred gates. Neither case indicates anything on the scale of the 4,000 to 10,000 logic gates necessary for designing an entire microprocessor circuit, but Thompson's program can be used very handily on subfunctions—especially where a chip is being modified or revised.

Current Analysis

After a digital network's logic has been worked out, the engineer moves right along—to the design and testing of the electrical circuitry which would run that logic in a real computer. Since Spectrum Software's MicroCAP simulates both the breadboarding and a test oscilloscope, the same program used to design the circuit can also be used to create a schematic diagram of the circuit. Then, returning to the program's test mode, the engineer can run several kinds of analyses. As the engineer goes through the simulation, graphs of scope traces are created, showing the same results that would come from a Tektronix scope.

Spectrum's program is capable of analyzing a circuit with up to 40 nodes or junctions in the circuit. Since such nodes are also found in non-logic circuits, the program can be used to test circuits that have nothing to do with computers. In fact, the program can even be used to model physical systems that have nothing to do with electricity.

One interesting example of the use of circuit simulation software to model things non-electrical comes from Martin Heller, principal scientist of the systems division at Physical Sciences, Inc., in Andover, Mass. Heller is using an earlier version of MicroCAP to model transient pressure variations in fuel cell systems—specifically in the sections where various gases are converted into the hydrogen the cells use for fuel. It turns out that MicroCAP's electrical transient analysis mode models gas pressure transients in fuel cell systems perfectly. And the simulation does the job faster and more effec-

(continued on page 123)

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CP/M 86	Yes	Yes	?
MP/M 86	Yes	—	?
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[1]For comparison purposes, typical professional configurations consist of 16-Bit 8088 Processor, 128K RAM with Parity, Dual 320K 5-inch Floppies, DMA and Interrupt Controller, Dual RS-232 Serial Ports, Centronics Parallel Port and Dumb Computer Terminal or Equivalent.

[2]Columbia Data Products also supports CP/M 80® with an optionally available Z-80 CP/M Expansion Board.

*As advertised in BYTE Magazine, August 1982.

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APPLE III	•			*	*	*	*	•		* Special Cabling or Converter Required
APPLE II	•		•	*	*	*	*	•	•	* DVM Board Required
ATARI 800	*		*							* Opt. Atari Cable Required
VIC-20			*							* Opt. VIC Cable Required
TRS-80	*									* Opt. TRS Cable Required
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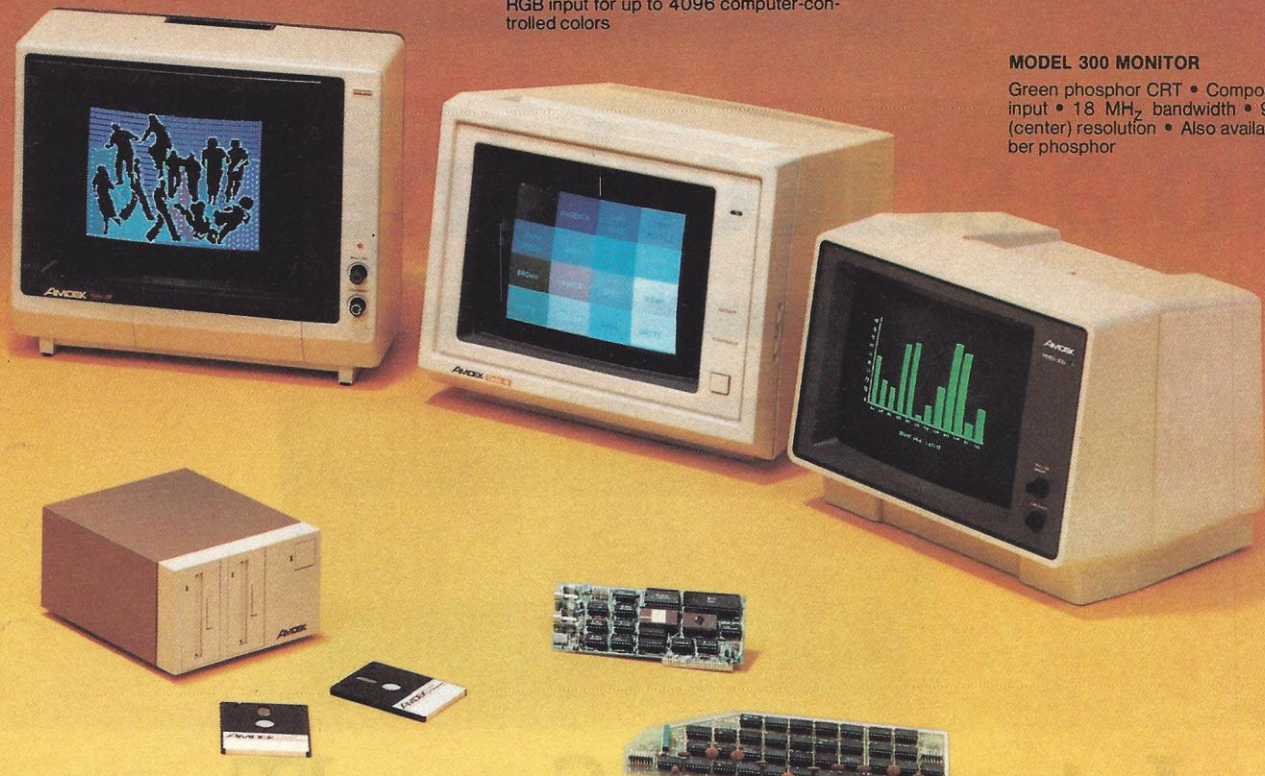

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CIRCLE 181

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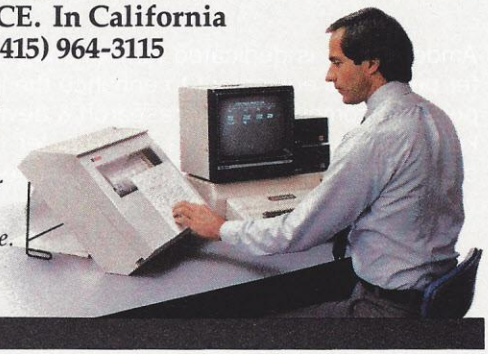

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CIRCLE 47

In the past, design engineers were under a strain. Time was of the essence, products had to get out. . .

LOGIC SOFTWARE

(continued from page 118)

tively than the alternative available to Heller—which is, running it on the company's Prime 400 minicomputer.

There are other electrical circuit analysis programs available. Apple sells one through its Special Delivery Software program, and there's a DC circuit analysis package for the Apple from Torric Corporation in Scottsdale, Ariz. Torric's integrated circuit design and test group developed the program for in-house use which means that you're not likely to find it on the market now.

Perry Valeh, a service engineer for Polaroid Corporation's Copy Service Division in El Segundo, Calif., is called on to redesign and update digital controls in the division's 20-plus custom cameras, lighting systems, and printers. That laundry list of equipment is the same stuff used to make negatives and copies of Polaroid pictures sent in by customers.

Valeh's design jobs generally involve fewer than 30 logic gates—which makes the use of computerization sound something like using a Mack truck to move a flower pot. But take, for example, the first job Valeh did with the program—a six-gater timing circuit for a camera's lighting system. That small task—at least compared to a 5,000-gate IC circuit—would have taken an experienced engineer like Valeh several days to complete. But Valeh did the whole thing in a couple of hours on his Apple, and he did the job at home.

Jim Norrish, an engineer with Micro Circuit Engineering of West Palm Beach, Fla., is one who agrees with Valeh about the value of designing logic circuits on a personal computer. He sees personal computers as helping engineers who have mainframe access, too. His company has two Data General Eclipse minicomputers and two Calma CAD systems, time-sharing on a Prime—and personal computers.

How do the small machines fit in with such heavy artillery? Very nicely, according to Norrish. The simulation software available through time-sharing was inflexible. It could, says Norrish, be used to design, but not to test the design. "Generating a test program would be very difficult. You'd have to go through (the entire program) to make sure all of the nodes have been exercised." Testing the logic circuits on personal computers solved that problem because Logic Designer has both design and test modes. And while it took Norrish a week to master the time-sharing program, Logic Designer took just a few hours.

Cost was, of course, a factor. According to Norrish, the time-sharing firm quoted $35 a run for a 1,000-gate integrated circuit—provided all went right on the first try. But of course it never did, and when the numbers were added it turned out to be more like $200 to $500 per IC.

Other voices, other uses

Anyone interested in finding other things to do with personal computers and logic design programs should see what Gerald O'Brien is doing at Ottawa's Ridgmont High School. He's using the program to teach eleventh and twelfth graders the elements of logic design.

The program, as a training device, wins high praise from O'Brien, especially because it enables him to set up logic sequences on-screen. He can then print out hard copy, and by joining sheets together he can map larger ICs. He also sees logic design programs as ways in which more advanced students can test the results of their experiments themselves.

Nor is the use of logic network design programs the sole purview of the science and math departments.

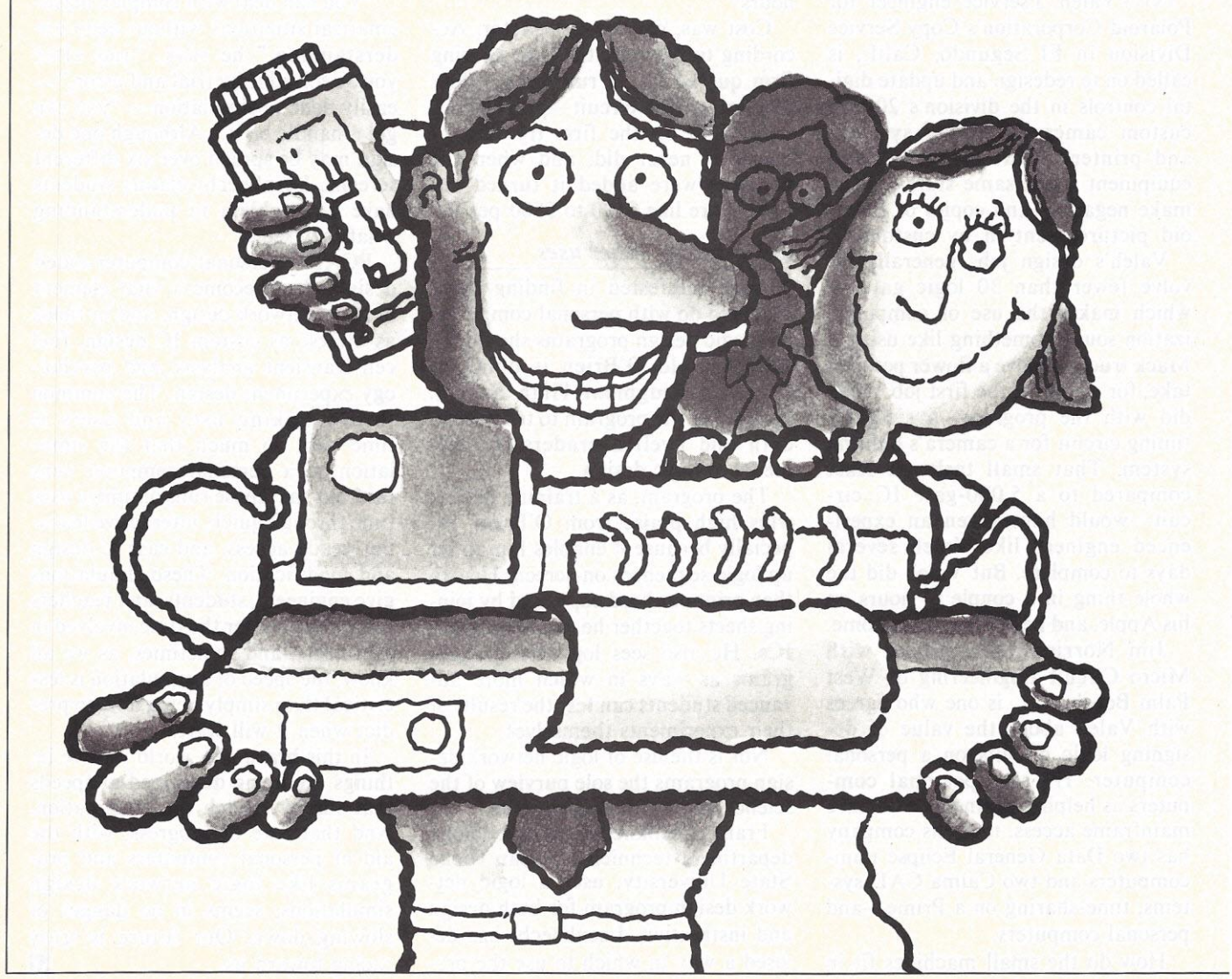
Frank Leenknecht, a psychology department technician at San Diego State University, uses a logic network design program for both design and instruction. Leenknecht has devised a way in which to use the program to test psychology experiment equipment—such as reaction time testers—as well as using it to train assistants. Other uses that he's found involve letting students come in with last-minute changes on their own experiments and run simulations of those changes. It's an effective way, as Leenknecht points out, of graphically showing students what it would take to revise their hardware.

Leenknecht reports that even though he's not a highly trained logic designer, the simulation program lets him create workable designs even when his theory is a little shaky.

"You can deal with complex mathematical situations without deep understanding," he says, "and after you've solved it by trial and error,"—easily done in simulation— "you can get a handle on it." Although one design may be spread over six different screens, Leenknecht claims students have no problem in understanding what they see.

PCAD—personal-computer-aided design—has become a vital element in logic network design, and in fields as diverse as custom IC design, fuel cell transient analysis, and psychology experiment design. The common thread linking uses and users is time—not so much that the simulation on a personal computer runs fast, but that those runs optimize user time through quick, interactive learning, ready access, and ease of design and modification. These simulations give engineers, students, and teachers more control over the time involved in a project—and sometimes, as we all know, the speed of a simulation is less critical than simply being able to predict when it will start.

In this brave new world we live in, things are being developed at speeds that simply stretch the imagination. And that rate of progress, with the aid of personal computers and programs like logic network design simulations, seems in no danger of slowing down. Our future is truly racing toward us.



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Camping And Computers— An Educational Alternative

Imagine children trundling off to summer camp to spend time learning about computers. Sounds like summer school instead of summer camp. Well, there's always time for everything—from boating to BASIC

by Elli Holman, Assistant Editor

Before school lets out for the summer, parents all over the country are making arrangements for their children to attend summer camps. Kids should be active during the summer, say parents. Kids should swim, play volleyball, shoot baskets, hit softballs, make ceramic ash trays, be with kids their own age—and learn how to use a personal computer? Well, yes, computer camps are becoming an educational alternative to the traditional summer camp.

But computer camps are not as widely dispersed as other more strictly recreational camps. They are, however, becoming more numerous than they were a few years ago. The National Computer Camps, for example, run by Dr. Michael Zabinski, a professor of computer science at Fairfield University in Connecticut, will offer its computer camping experience at three different sites this year—one camp in the Northeast, one in the Southeast, and one in the Midwest. The Atari Computer Camps, sponsored by the folks who make Atari 400 and 800 personal computers, will also be computing coast to coast, with seven locations from Massachusetts to California.

This summer will be the sixth season for the original computing camp organization, the National Computer Camps. About 150 children per week attend these overnight summer camps at their different locations, which translates to approximately 1000 children per season. It costs parents $350 a week to send a child to the camp, and the youngster can go for as many weeks as he wishes, or for as many as his parents can afford.

cartoon by John Stevens

Instructors at the National Computer Camps—who give computing instruction in their respective schools during the academic year—use Apple, TRS-80, and PET personal computers to teach students programming at beginner, intermediate, and advanced levels. Data processing and file management are also taught, as well as machine and assembly languages for the different kinds of computers available at the camp sites.

The ratio of students to teachers at the camp is 12 to 1, and a teacher's assistant is present in all groups to help debug programs.

Before a child comes to camp, he fills out a personal background sheet (approximately one-third of the

Research for this article was contributed by Stefanie Kott and Edwin Hutchins.

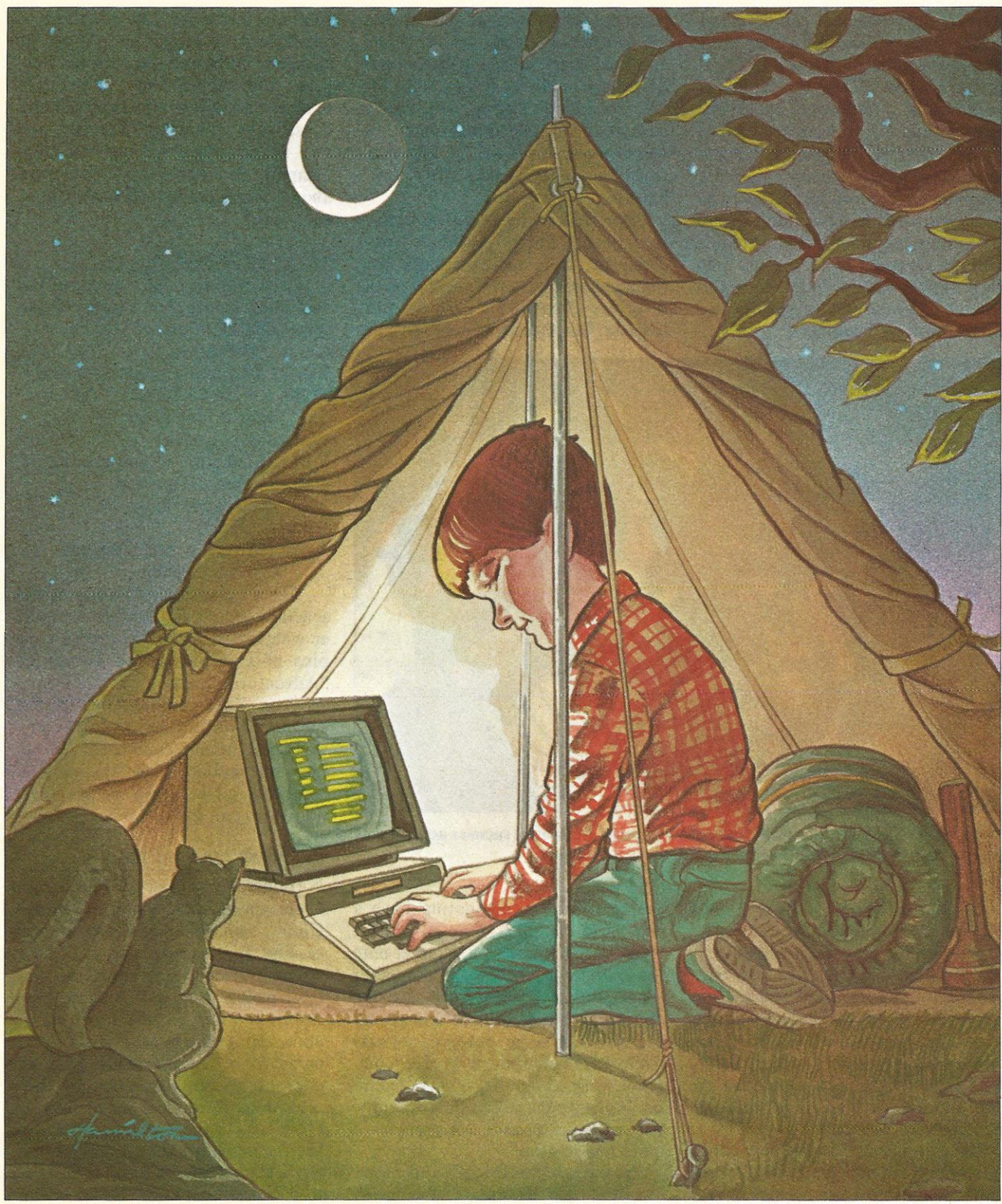


Illustration by Marcus Hamilton

"Those who come to computing camp for computing have a chance to compute as much as they want, rather than being forced onto the ball field."

campers have personal computers at home) from which the camp staff organizes computing groups on a preliminary basis. When the child arrives, he is interviewed by an instructor, and his answers are used to further separate the groups. For example, if a child has never touched a computer before and just happens to be 10 years old, he's put into a group for young beginners; 13-year-olds with no computer skills are put into the group for intermediate-age beginners, and 15-year-olds are placed in a group for older beginners.

At the Atari camps, the kids participate in a number of traditional summer activities, as well as daily two-and-a-half-hour computer-education classes.

Of course, when a child gets into assembly- and machine-language programming (the high-end stuff), age is of no consequence—the only criterion is background. "We have 10-year-olds in machine-language programming as well as 16-year-olds," says Zabinski. "At that point, with the background they have, they can interact well, so there we don't differentiate by age."

But computing isn't the only activity at the National Computer Camps. There are also the usual kinds of recreational facilities available, including swimming pools, tennis courts, and field-sport setups. Kids can participate in anything from weight lifting, to aerobic dancing, to tennis, to basketball, to swimming—but these sports are optional—if the kids don't want to participate, they don't have to.

"Our philosophy has always been that recreation is optional," says Zabinski. "It is made available on a regular basis, at certain times of the day, for those who wish to participate. But those who come to computing camp for computing have a chance to compute as much as they want, rather than being forced onto the ball field." Since the computer room is always open, kids have the opportunity to go outside and get involved with some outdoor activity while others continue with their computer work. A computing staff member is always in the computer room to help with any questions or problems a child might have.

There is a separate staff, and a separate camp director, for non-computer activities. These staffers—approximately 15 per camp—are in charge of dorm welfare, personal welfare, and recreation. "A teacher teaches and that is all that he or she does," says Zabinski. "Teachers are not responsible for out-of-the-computer-room activities." There are about 25 computer staff members at each camp.

All in a day's work

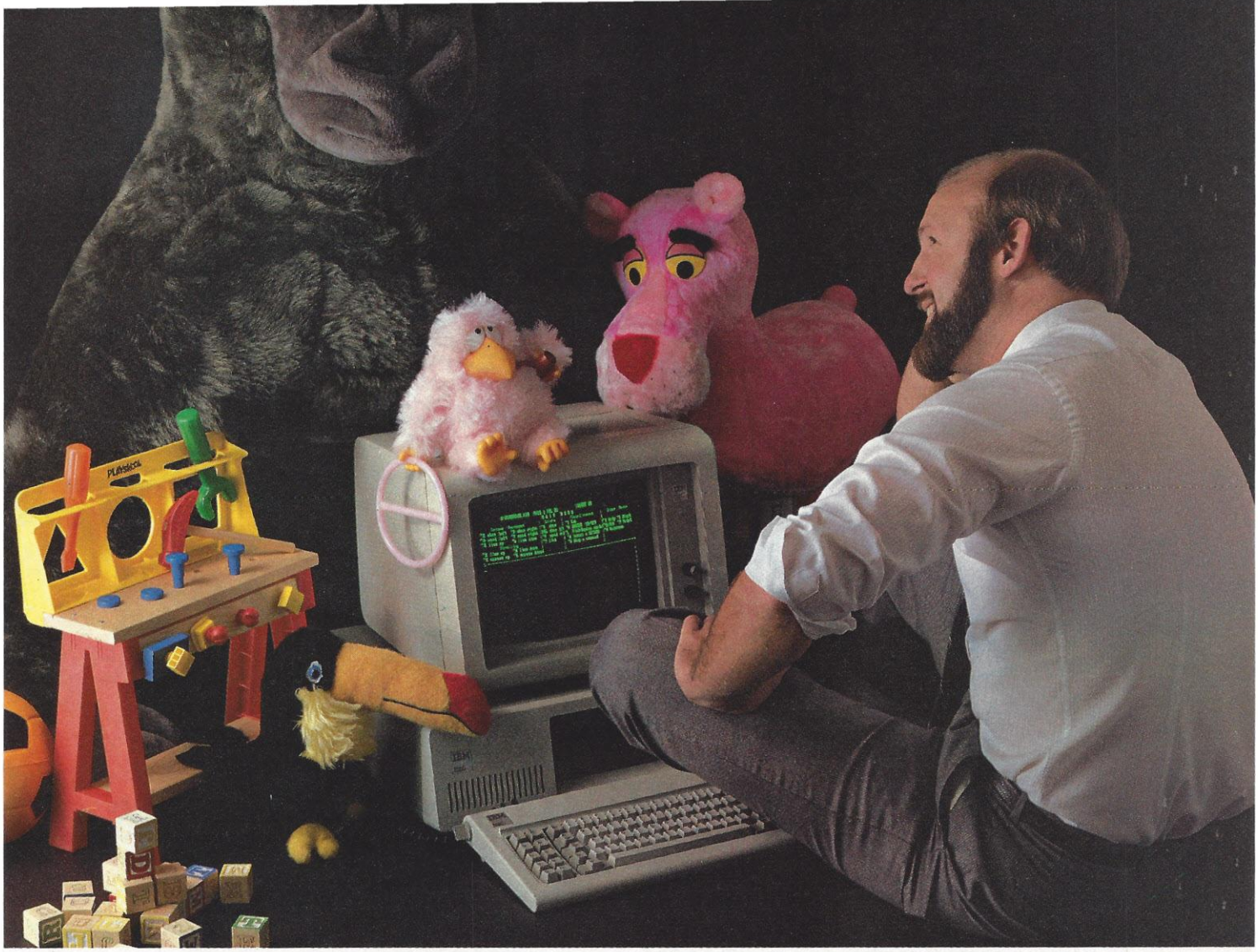
A typical day's schedule at one of the National Computer Camps looks something like this:

8 a.m.—Breakfast
9 to 11:30 a.m.—Computer Room
11:30 a.m. to 12:30 p.m.—Optional Recreation Time
12:30 p.m.—Lunch
1:30 to 4:30 p.m.—Computer Room
4:30 to 6 p.m.—Optional Recreation Time
6 p.m.—Dinner
7 p.m.—Evening Activities and Special Events

The special events portion of the schedule usually involves the computer whether it be the "Special Olympics of Computing," a computer "Adventure" evening, or a keynote speaker. Last summer, one of the speakers who traveled to each camp was Scott Adams, founder of Adventure International, or "the king of computer adventures," as Zabinski prefers to call him.

Teaching teachers too

National Computer Camps began operation as a day camp in Orange, Conn., and still runs a day-camp session for kids in the middle of August, after the overnight sessions have ended. But, at the same time, Zabinski offers an adult institute for about 30 teachers who wish to become more familiar with personal computers and use them in their classrooms during the academic year. He instructs the teachers on how to use the machines, how to program in BASIC, and how to teach computing to kids.



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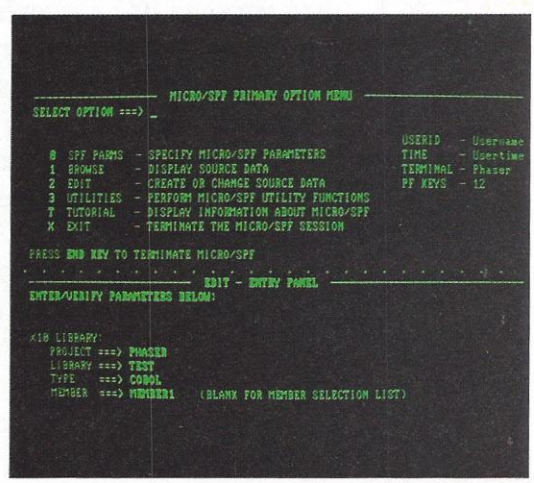

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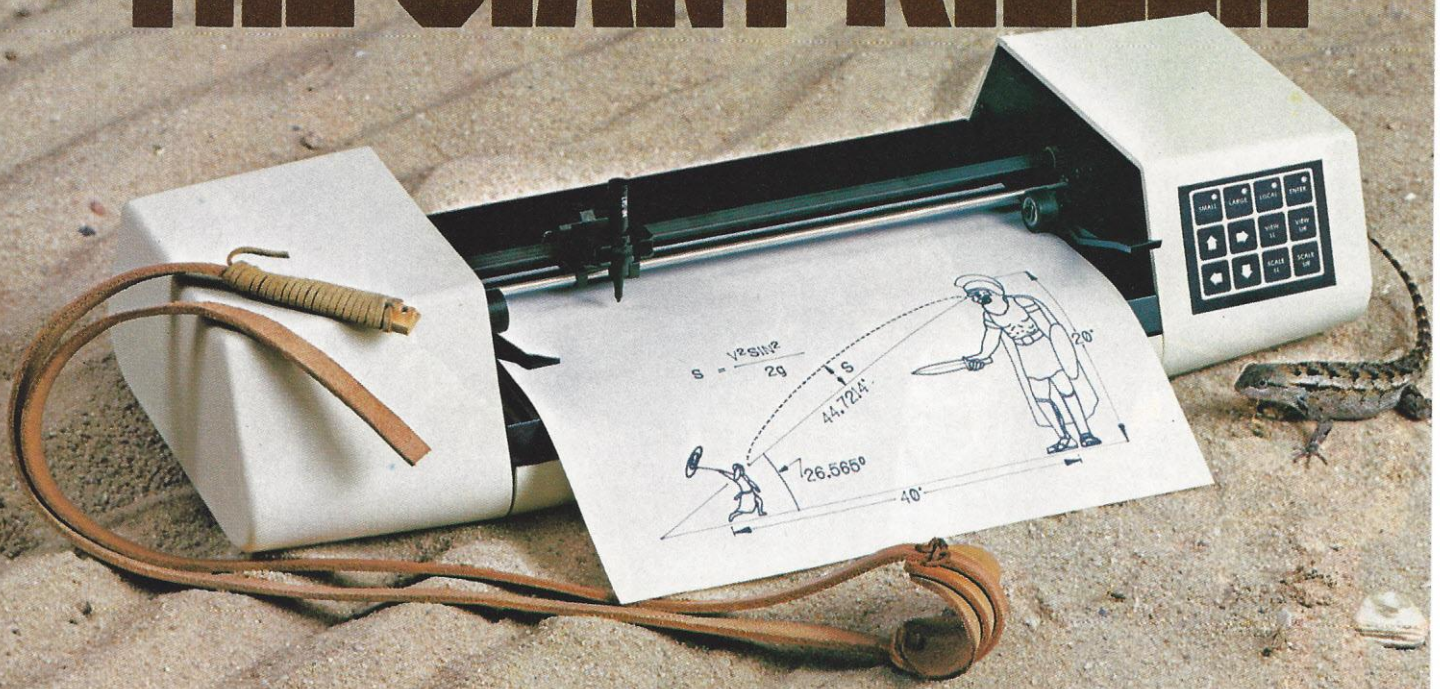

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CIRCLE 51

4R006

Kids should swim, play volleyball, hit softballs, make ceramic ashtrays, be with kids their own age—and learn how to use a personal computer.

There are two teacher institutes that run back to back—the first week is for beginners and the second week is for intermediates. During these sessions, teachers get a chance to "student teach" or practice, by interacting with the 100 or so youngsters involved in the day camp held at the same site.

Some of the teachers who do well at the institute and continue to use personal computers throughout the academic year, become National Computer Camps instructors the following summer. "The point," Zabinski says, "is that we closely screen our teachers, and we want to make sure all of them are not only good teachers, but are knowledgeable in the area of computers."

In addition to the institute for teachers, Zabinski offers a one-week session the first week in August for youngsters with diabetes. The camp has made special arrangements to have a team of physicians on duty all week to keep a close watch on the kids.

This year the sites for the National Computer Camps are: Westminster Prep School in Simsbury, Conn.; Oglethorpe University in suburban Atlanta, Ga.; and Chaninade College Preparatory School in St. Louis, Mo.

There's more than computing

Another summer camp alternative was established by Atari, Inc. The idea behind the Atari Computer Camps is for youngsters to spend part of each morning and afternoon in classrooms, learning about computers, and the other part of the day participating in conventional camp activities.

Just as the National Computer Camps organization schedules daily activities for its campers, the Atari camps divide activities into morning and afternoon sessions, free-time periods in the late afternoon and early evening, and evening programs. Children must participate in a variety of traditional camp activities—swimming, tennis, team sports, arts and crafts, nature hikes, drama, aerobics—each morning and afternoon. However, because this is a computing camp, each child must also spend a total of 2 ½ hours in computer classes each morning and afternoon.

Among the evening programs—in addition to dramatic productions, movies, and campfires—are speakers from the computer field. Past speakers included Dr. Alan Kay, Atari's chief scientist; and Jim Dunne, an advanced programmer at Atari.

using personal computers to teach the children to teach themselves. Beginners start with a computer-readiness module that teaches them how to use existing software, including a painting program, a music program, a word processor, an adventure game, a data-management program, and an ecology simulation program. Using the Pilot language, kids are exposed to fundamental programming concepts through applications in graphics and sound. Moreover, they are encouraged to work with partners and experiment independently.

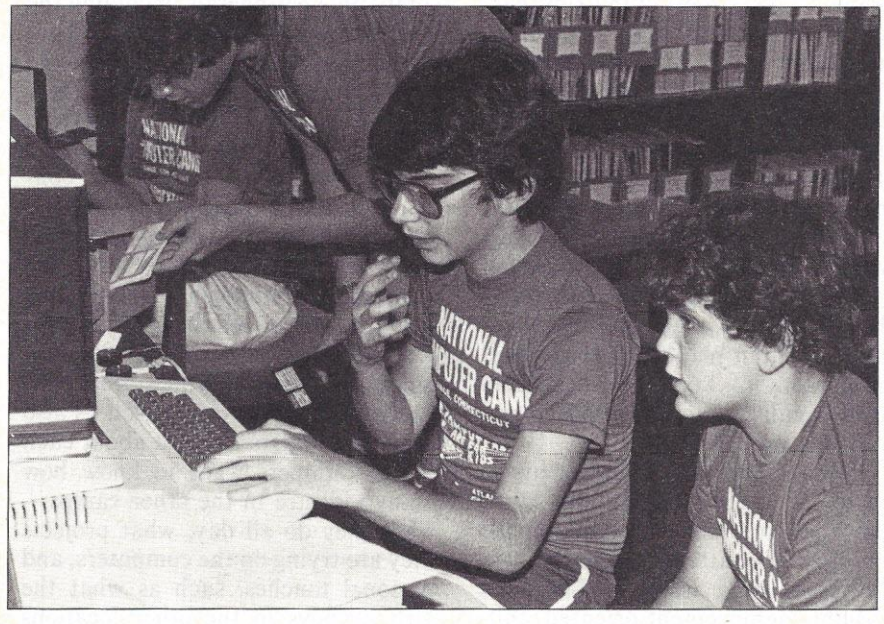

photo courtesy the National Computer Camps

In its sixth season, the National Computer Camps organization offers kids the opportunity to learn subjects such as programming, data processing, and file management.

Before the children attend the camp, they must fill out a questionnaire that prescreens their computing literacy. Within hours of arriving at the camp site, each child is tested to ascertain his level of proficiency for placement in the computer program. The children are grouped both by age and computing ability. The camps offer three levels of computer courses—beginner, intermediate, and advanced—that expose the children to a wide range of software.

The curriculum concentrates on

Intermediate level students use either BASIC or Pilot, and work with four-color and character graphics, programming, joysticks, animation, sound effects, and music.

Advanced campers are individually supervised by an instructor who helps plan their projects. Last summer's advanced projects included an airline-reservation system, a file-management program, data-management programs, and various games, complete with sound and graphics.

"Before I came to camp, I thought everyone there would be computer nerds or little Einsteins."

Depending on their proficiency, some campers are exposed to player missile graphics, custom display lists, machine architecture, and Atari 6502 assembly language. Although most of the children work in BASIC, other languages—such as Pascal, LISP, and Forth—are available for campers to explore on their own.

According to Bob Kahn, director of curriculum for the Atari camps, the expectations of the children who attend these camps tend to be different from the expectations of children who attend conventional summer camps. "I'd say most of the kids, particularly the beginners, found the computers to be the most exciting and best part of camp, and that's why they came," he says. "But they also expected that they were going to do other things. They weren't there to be in summer school necessarily. They were there to have a good time. They wanted to go out and play baseball and do other things, just as much as they wanted to play with the computers." Kahn points out that about 70 percent of last year's campers were beginners, and that their common age was 13 or 14.

Linda Gordon, vice president in charge of special projects for Atari, says that she finds that many of the children who attend the camps are not computing literate. They are "bright, achievement-oriented children," she says, "whose parents are caring, thoughtful, and concerned about their children's futures—highly intelligent people who may or may not be into computing."

Each of Atari's camps is headed by a director who has experience teaching children about computers. The classes, which have a maximum of 24 students, are led by a trained instructor with similar experience. Each instructor is assisted by college-level computer science majors or recent graduates in the field. An "Atari Whiz"—a computer expert well-versed in Atari equipment—presides over the advanced classes at each camp. This expert is available to assist in all matters having to do with computers.

No shortage of equipment

As you might imagine, there is no shortage of computer equipment at the Atari Computer Camps. This season, in addition to the Atari 400 and 800 computers, each camp will have a new model Atari personal computer, not yet released at press time. Other equipment includes printers, 10-key numeric keypads, disk drives, and other Atari-compatible peripherals, including the Versawriter graphics tablet from Versa Corp. (Newbury, Calif.); the Sound Synthesizer by Votrax (Troy, Mich.); and Terrapin Turtles from Terrapin (Cambridge, Mass.).

All seven Atari camps are connected by a communications system—using a modem or a network. The system allows both instructors and students at the various sites to share teaching and programming questions. This communications system, which was connected by modem last season, is also used by campers to learn about each other. Campers want to know how many kids are in the other camps—what they do all day, what projects they are trying on the computers, and personal touches, such as what the girls or boys in the other locations are like.

When the kids tire of chatting back and forth, they can take part in, or even invent, other learning applications. One musical application the kids invented revolved around an instructor's guitar playing talent. After he strummed a few bars of "Hey La De La De," the students programmed two of the computers to play the song. Since the camp has a music-composition program, the children input the data for the accompaniment part of the song into the program. On another computer they input the melody. Then they counted to three and hit the start keys on the respective computers, to synchronize the melody with the accompaniment. They effectively replaced the instructor's strumming with computer music.

Another group of children decided to have a race between a real turtle and a robot turtle, a device that looks more like a vacuum cleaner than a real turtle. The children, who were very protective of the real turtle when the robot turtle seemed to threaten it, found the live turtle very uncooperative. They programmed a course for the robot turtle to follow on the computer—two feet left, for example—and hoped that the live turtle would follow the same path. Instead, the live animal changed its direction and went wherever it pleased. Since the live turtle had a mind of its own, no winner was ever declared.

More free time activities

When campers aren't spending their free time working out applications in the packed computer rooms, they can usually be found in one of the two libraries. One library includes over 150 software titles; the other carries more traditional tomes, with computer and science-fiction titles.

The sites for the seven Atari camps this summer will be college campuses located in Greenfield, Mass.;Glencoe, Md.; Ashville, N.C.; East Stroudsburg, Pa.; Fairbault, Minn.; Danville, Calif.; and San Diego, Calif. The cost is $890 for a two-week session, $1690 for a four-week session, and $2950 for the eight-week session. Extra weeks cost $425 each.

But no matter which camp session children attend, they'll agree that any initial fear they may have experienced was groundless. During a focus group that was held after camp last season, for example, one child said, "Before I came to camp, I thought everyone there would be computer nerds or little Einsteins." Instead, she was happily surprised to find that every camper was just like she was—a regular kid.

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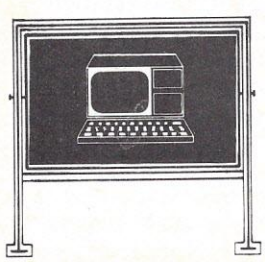

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Software Documentation: Reading A Package By Its Cover

Software documentation often leaves something to be desired, according to some who have tried everything but a language course in Swahili to understand it

by David Collopy

Traditionally, software documentation has been panned by reviewers as being incomplete, poorly organized, and miserably written. And with good reason—it usually is. Good documentation should teach you "how to use" and "what you can do with" the software, simply and effectively. Obviously, "good" is a relative term—what may be satisfactory documentation for an experienced user may not be accessible to someone buying his first software package for his first personal computer.

Before you select any software package, the documentation should answer questions regarding your most basic needs and expectations. But there's a Catch-22: Some documentation may teach you the elementary features very clearly—and then have an advanced section that is nearly indecipherable. Talk with other users—say, at a computer-users group—who have bought a particular software package, to learn from their experiences.

Nearly every activity in which we involve ourselves requires some type of instruction. In the personal-computer industry that instruction most often comes in the form of software documentation. You may consider yourself a member of the technical aristocracy or you may readily admit to being a novice. Either way, learning to use a software package on the personal computer is not unlike learning to assemble a bicycle. You may have put together and taken apart quite a few bicycles as a kid, yet find yourself confessing you've never even ridden one with a 10-speed derailleur system. You've got something new to learn. And, good documentation, as in the saying about a good man, is often hard to find.

Although my programming friends like to remind me of just how far personal-computing software has come in a very short time, I think it's fair to suggest that you carefully examine these products before you buy one. I use the term "product" in all its competitive, free-enterprise, consumer-pay-attention, ours-is-better-than-theirs kind of glory, because the packages do compete for customers in the open market. In other words, the product is the whole package—software plus documentation—that the dealer hands you once you've handed the dealer your money.

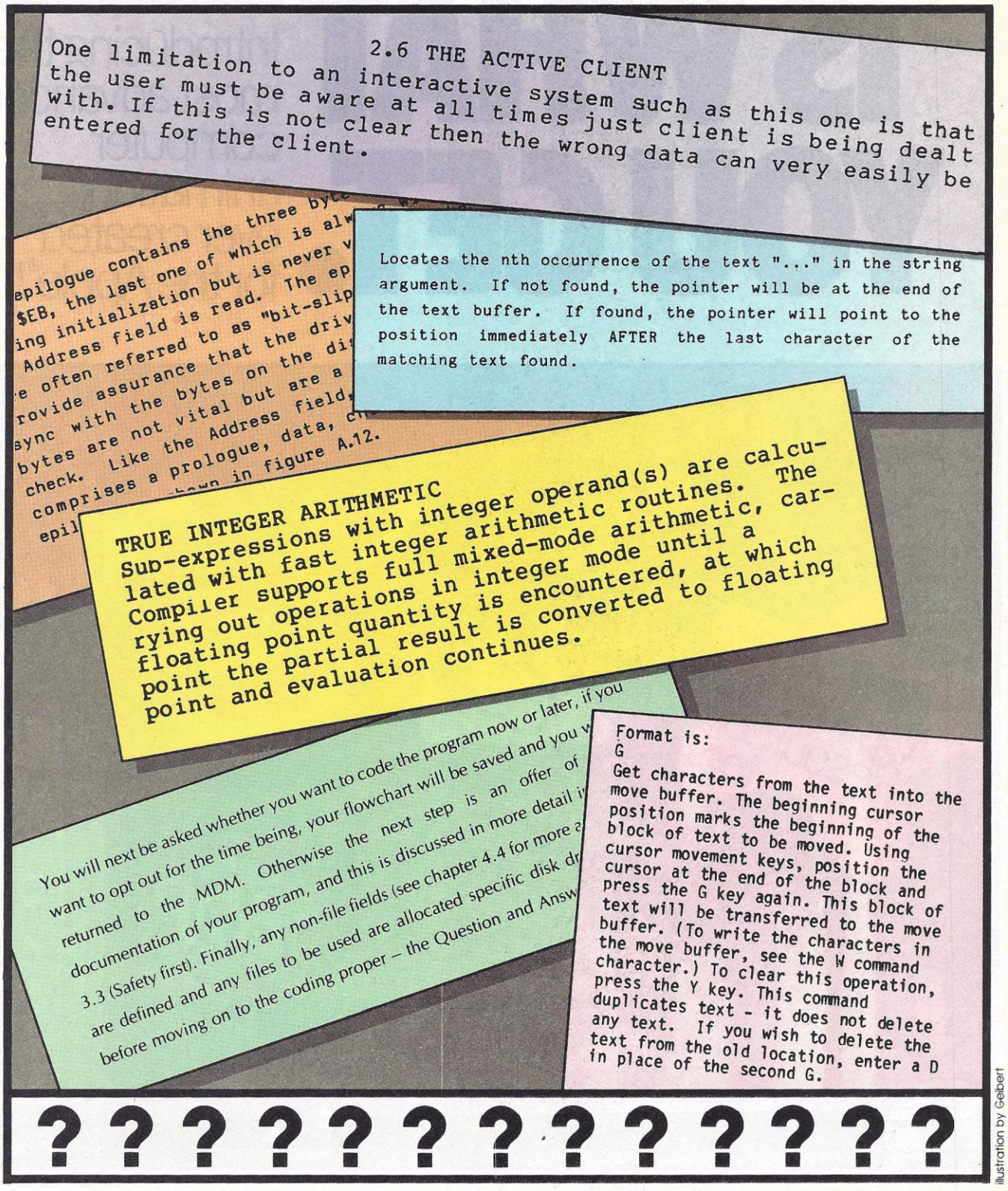
Say you walk into the local computer store in search of word-processing software. The dealer, naturally, offers a recommendation or two, and you respond that you're "just looking." More often than not, what you're looking at is a box or a binder that contains a prerecorded program along with a book. Up front the book tells you that this word-processing program is the greatest word-processing package to come along since movable type. It reassures you that it is the easiest-to-use program ever designed by man.

As you flip through the pages, you find every detail and nuance one would ever care to know about the fine art of programming a computer. Someplace in there it offers a lesson or two on word processing. Yet much of what you read is unfamiliar and technical—and voluminous as well. Moreover, everyone has heard horror stories about crucial inconsistencies in cryptic instructions or cryptic commands that lost everything in memory. And frequently one hears frustrated complaints about the difficulty in learning and referencing some of a program's most advanced and powerful features.

When you're shopping around for software, how can you tell before you

(continued on page 139)

David Collopy is a free-lance technical writer, specializing in computing, from Cincinnati, Ohio.



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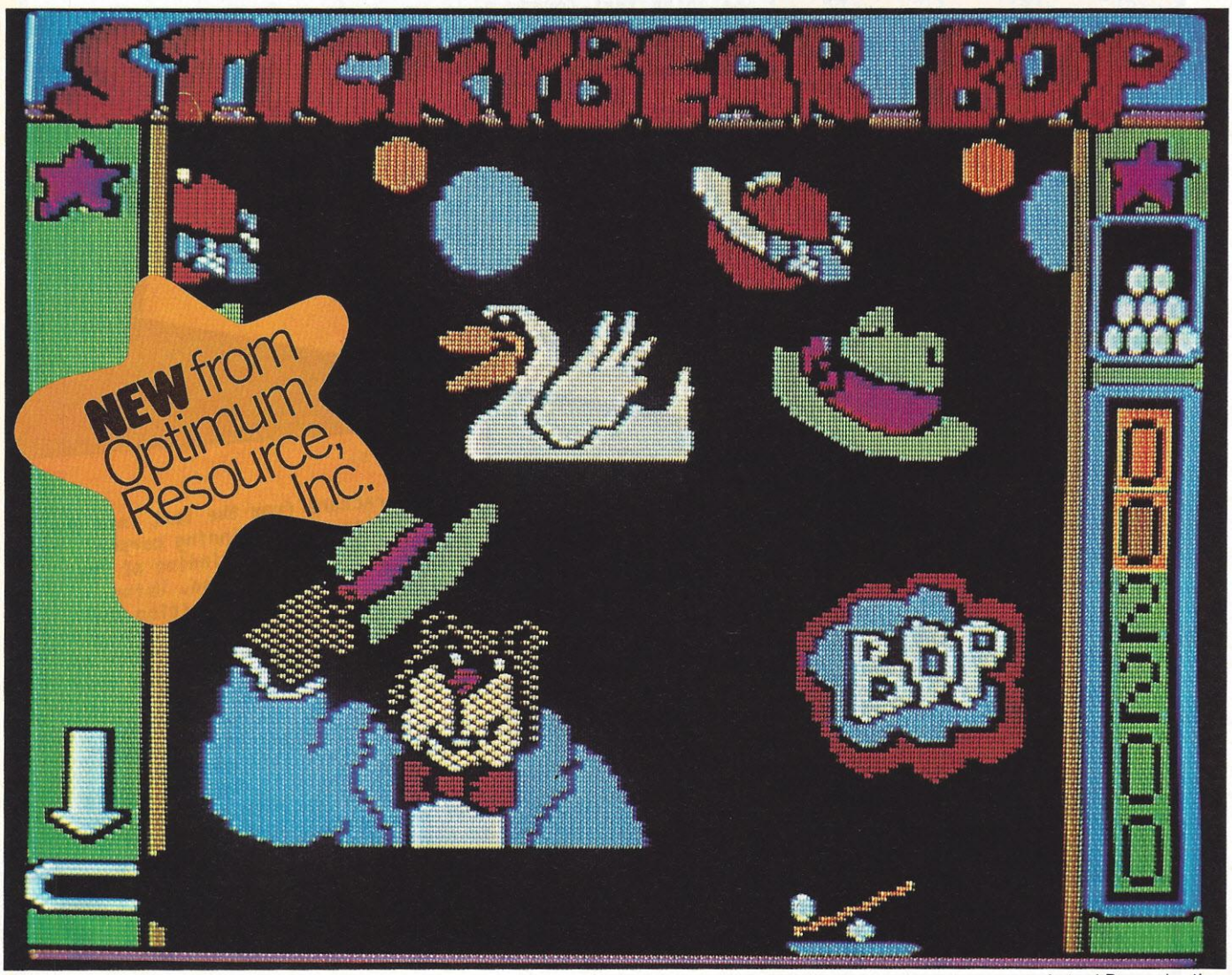

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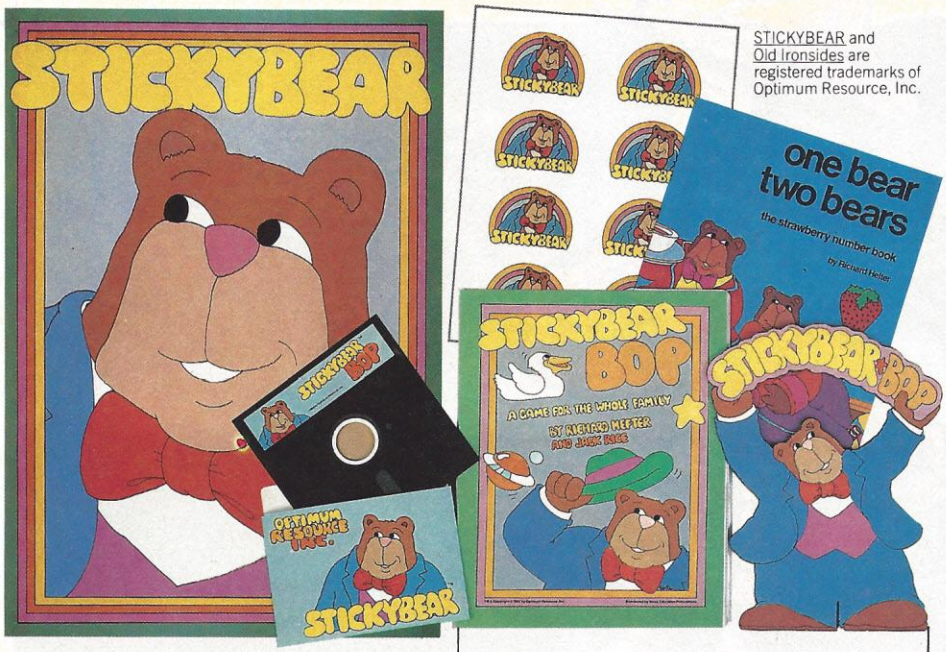

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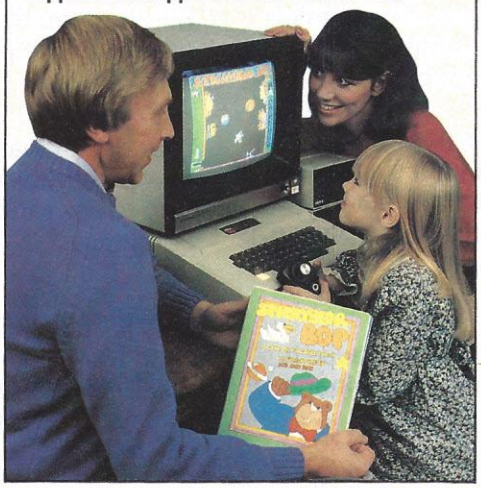

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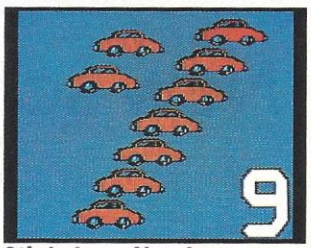

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CIRCLE 46

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"The instructions for using software have to make using it as easy as learning to use a refrigerator."

SOFTWARE DOCUMENTATION

(continued from page 134)

buy that this program will be compatible with your computer? How can you tell (without spending eight to 10 hours learning the entire software package) that the program will do all you need it to do? How can you determine how easy it will be to learn to use the commands—and refer to certain features later when you need them?

An essential background

How is it that programs evolved so far with such clarity and sophistication, and yet the instructions to users are often so abysmal? The reason is rooted in the heritage personal computers have been bequeathed from the days of mainframes and minis.

The earliest commercial computer systems and applications required a minimum of written information because part of the package included on-site support. The software vendor would sell or lease computer software, with a guarantee to the customer that an expert would always be available. This practically full-time support person did everything from install the product to debug the programs. Because the services he offered made him intimately aware of the customer's particular data requirement, he became well-known by his constant presence. Anybody in the office could tell you, "He's in the last room down this hall."

There was seldom a need to communicate technical information on paper. The expert had all the answers. When he was stumped on a problem, he would merely call his home office and work it out with help from another expert. When there came a need for one expert to communicate with another on paper, the type of information that was transferred was usually some crude or abstract document intended to convey technical information, such as program listings, logic program flow charts, computer-room operation instructions, or every memo ever written about the system.

When the dramatic hardware developments that led to substantial price reductions of computers made computer technology available to ever-increasing numbers, new demands for expert support of software products came with the new customers. No longer were the developers able to give each customer personal service. There was clearly a need to educate large numbers in an inexpensive and effective way. This need to tell the customer how to use the computer software was met by the most primitive versions of what is known as documentation.

In the early days of personal computers, the job of writing the documentation was—ironically—often assigned by default to the least knowledgeable member of the programming staff. The vendor couldn't afford to lose the precious time of one of the more experienced developmental programmers. The documentation immediately took a back seat to every other meaningful job. In fact, it was so far down the list of priorities that it sometimes didn't make the list at all.

The new "technical writer" would accumulate as much information as he could put his hands on and assemble it into a reference manual. The strategy was almost always, "Tell them everything they'll ever want to know about the product. And make a lot of copies. We've got a hot one here."

So the new customer was given the opportunity to look at feasibility studies, detailed development plans, requirements definitions, project-initiation specs, software-justification evaluation studies, and others. Great stuff, if they were planning to go into business as software developers.

This made for some poorly organized manuals, but you could be reasonably sure the answers to your questions were in there—someplace.

Although today the situation is not that bad, many software developers disagree about what is important information. Each organization seems to have a different method (and, therefore, result) for developing software and publishing manuals. There is very little consistency and there seem to be no standards. Many of these differences are understandable, since it is the unique and well-developed product that will rise to the top in the marketplace. No one would expect to see competitive general-ledger programs that look too much alike. On the other hand, one would hope to find some consistency between the general-ledger program and the inventory-control program developed and marketed by one company.

The trend now is to involve professional writers in the development of software documentation, often at an early stage. With this trend is coming a new generation of what are sure to be more readable manuals. No longer is writing the responsibility of the least-experienced junior programmer. One important plus is that normally the technical writer will have a good general computing background but will not know too much about the specific program being developed. Therefore, the technical writer is able to analyze the program objectively and write the documentation without making assumptions.

Technical writers may even be involved in helping to write the software as well as the documentation. Such is the case when the program being developed is to include a large portion of embedded text. Programs designed around the English language must be certain to use that language correctly (and simply). Technical writers are often given the responsibility of writing the prompts and other screen messages. Sometimes this activity will be handled by a programmer who has both an ability to use the language and an interest

Don't believe advertisers' claims that all you have to do is plug the program in and turn the computer on.

in writing. Whether the text is written by a technical writer or by a programmer capable of changing hats, the relationship between the writing of words and the developing of a code begins at the earliest stage of product design.

"The documentation people are really getting to be experts at training and in making sure the documentation teaches the people who use the product," says David Kwett, documentation manager for Sorcim Corporation in Santa Clara, Calif. "We are also getting more involved in the way the product looks to the customer."

What is good documentation?

Now that you know why manuals have lagged behind the software they document, what should you look for in software documentation?

Good documentation should teach you how to use the software in the simplest and most effective way, and it should continue to serve as a ready reference once you know what you are doing.

When you decide to buy a software product, you are usually buying it because it will allow you to use your computer in a way that will save you time, money, or both. Many of the products on the market allow you to accomplish both objectives. The documentation should be a good indicator, defining the amount of time you will have to invest to become proficient in using the program. You should also be able to look at the documentation and discover how quickly you will be able to use the more subtle (and extremely valuable) advanced features of the software. And it should permit you to readily refer to those features you may need on the spur of the moment, to remind yourself of a sequence of commands to accomplish any specific task. But what is considered "good" documentation is relative to the user's level of expertise, so you should look for software that you find consistent, clear, and easy to use.

Now that you have some idea of what good documentation should accomplish, how can you select a software package suitable for your needs, your computer, and your level of expertise?

First, consider your needs. Say you're looking at word-processing packages because you and a co-author want to write The Great American Novel. You own an Apple II Plus and your co-author owns a TRS-80. Obviously you have several prerequisites. You want to choose a software package that will be compatible with both systems. The package should be able to handle large files, because you don't want to link files every few hundred words. It should probably include a facility for automatic pagination. Beyond that, consider what else is important to you: underlining? superscripts? footnotes? Before you even select any software package, the documentation should be able to at least answer questions regarding your most basic needs and expectations. Any product you choose must live up to your expectations before you will consider it a good investment.

How to select software

There are literally scores of software packages available for almost any common use—word processing, accounting, etc. How can you quickly narrow the field to a half-dozen finalists without singlehandedly trying to compare every product on the market?

First, read the advertisements for the type of product that interests you. What promises and guarantees are made? You'll want to check advertising claims of capability and ease of use of each package against the documentation later on, to find out how powerful and easy it really is. More important, read the reviews of those products in computer publications as well as in newspaper and magazine articles. Review articles are less likely to show advertising biases and will give you a somewhat objective idea of the kind of information to check in the documentation. The reviews may also give you some preliminary idea of the differences among competitively priced software packages and may tell you which software packages are compatible with which personal computers.

Be forewarned: Reviews will often give high marks in categories such as performance, usability, and so forth, and yet tear the documentation apart. Traditionally, software documentation has been panned by reviewers. On the other hand, a gem is sometimes found—and again the trend has been toward recognizing improvements.

A recent survey of industry experts supports these reviewers' claims. "In fact, the quality of documentation is a reflection of the quality of the existing software," says Roger Tuttleman, director of software development for Sensible Software in Bloomfield, Mich. "You need look only at the Apple market to see how torn up it is. There are very professional companies, one-man companies, and groups of people trying to market programs. Just like the tremendous scope of the quality of the programs, the scope of the documentation goes from nonexistent to very good.

"In the last few years documentation has taken on a more important role. Altogether, packaging has become more important. Having a good-looking package becomes a very big selling point."

"As the personal computer moves into wide general use, more people who use the software don't know programming, never intend to learn programming, and rightly assume they have no need to," says Bill DeVille, a free-lance technical writer currently working with Silicon Valley Systems in Belmont, Calif. "The instructions for using a software product have got to make using it as easy as learning to use a refrigerator."

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The time you spend reviewing the documentation and testing the software at the computer store will prove a wise investment.

After reading reviews of various programs and their documentation, you will probably have something of an idea about which competitive products you want to examine more seriously.

Much of the software on the market is not menu-driven in such a way as to present the user with a limited number of options at each step. Many of the data-base products fall into this category. The documentation for such software should be strong in the tutorial area. Normally this documentation will be presented in a series of lessons intended to teach you about the product and the many activities you are likely to perform with it.

If you have never used similar software, the place to begin is on page one. Read the first lesson and see how easy it will be to get the hang of using this product. Don't make the mistake of going to lesson 10, because if you've never used anything like it before, you'll find yourself lost. The tutorial method of documentation is designed to give you bite-sized morsels of information that later build on previous lessons; you should examine it with that in mind.

The ideal method of researching your software purchase is to sit down with the product on a computer that is configured in the same way yours is. While at the computer store, work your way through at least one or two lessons. Don't make the mistake of using a word-processing package on a computer with two disk drives if yours has only one disk drive. The difference can be substantial, and you may be convinced later that you've bought the wrong product (or that you'd better get a second disk drive).

What about advanced features?

Once you're satisfied that the basics of the product are easy to learn through the documentation's tutorial, you may want to try something a bit more complicated. Here's where you'll check the advertiser's claims for the power of the software. Some vendors highlight the advanced features in a way that may lead you to believe that all you have to do is plug the program in and turn the machine on. Yet you should be aware that learning most of the more powerful features requires more of an investment of time and effort than placing a disk in a disk drive. And the documentation manual should tell you that.

Look ahead. If you have the time, try to push the program to its limits. Remember, of course, that many products on the market are very complex and powerful tools. It would be next to impossible to fully test them in one sitting. But you do want to be sure you'll be able to learn the more complex functions as you go along.

Remember that some documentation may teach you the elementary features very clearly—and then have an advanced section that is virtually impossible to decipher, even *after* you know the basics.

To avoid having to master an entire program before buying it, talk with two or three users who have bought that particular software package, to learn from their experiences. Ask your dealer for the names and telephone numbers of several customers, and then call them and ask them what advantages and disadvantages they found. Also ask your dealer whether there is a local computer-user group for your type of personal computer. A computer-user group is a group of users of one type of personal computer—Apple, TRS-80, etc. There you can compare notes with people who have the same system as you do, who have already spent the money and time on the program that interests you.

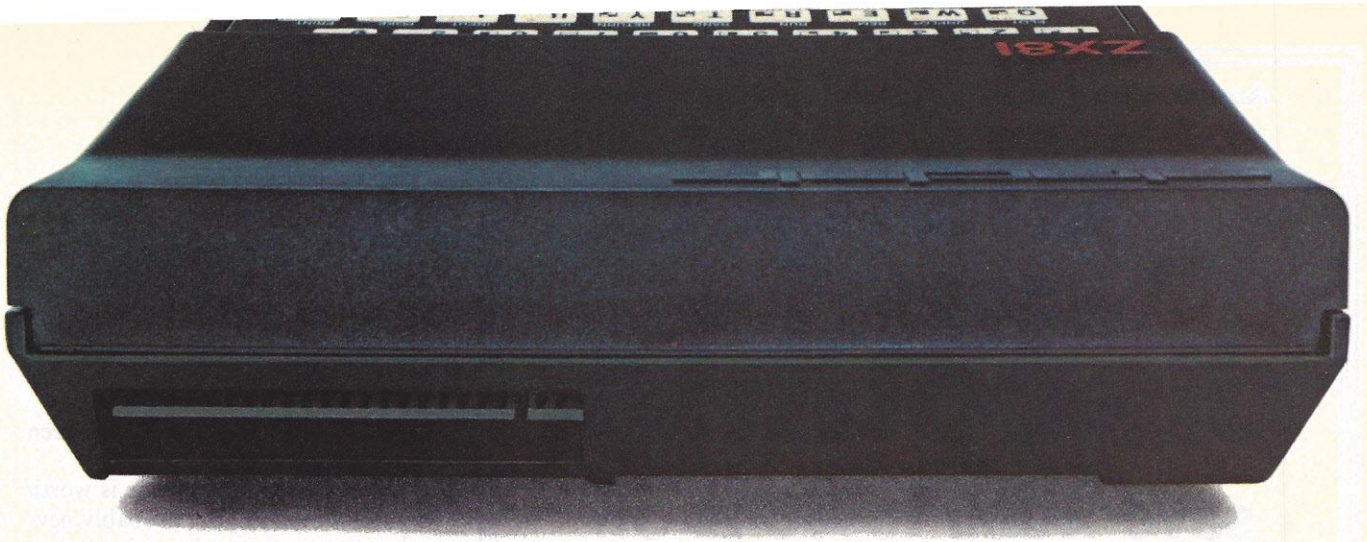
Keep in mind that there are a number of very good programs with poorly organized documentation. If you have the expertise, you may be willing to put up with jumping back and forth to find the answers, if you're sure the program does what you want it to do. But be convinced that you're truly willing to put up with that before you leave the store with your new purchase. The headaches you get later might have been eliminated if you had been willing to examine similar products with better documentation.

Is it easy to reference?

Oh, if it were only that simple. Much of the software on the market today is linear: The logical flow of the program is menu-driven, and at each step you are faced with a direct choice of options. Many word-processing software packages fall into this category, and the documentation appears to be simple and straightforward. Your research of the documentation is primarily to find out whether the program offers the options you'll need to write your novel, as the case may be, and how easy it will be for you to learn to use them.

Be sure to examine the reference section, if one is available. If a reference section is not available, at least be curious as to why the manual doesn't have it. There could be a perfectly good answer. Perhaps the terms and commands to which you will most often refer are prominently displayed in the text with boldface type. At least satisfy your curiosity about how easy it will be to find specific terms. Check the index for terms that are already familiar to you, such as "indent." Look up a few words and hope to be satisfied with the results. Does the word "indent" have the meaning you thought it would? If not, is the new meaning explained to your satisfaction?

Also, even documentation that is designed primarily as a tutorial should be easy to reference. After you've gone through a few lessons, see how easy it is to find something you've learned. Through these tests, see if your initial impression of this software has changed. If it has, you may have saved yourself from making the wrong purchase. If not, the



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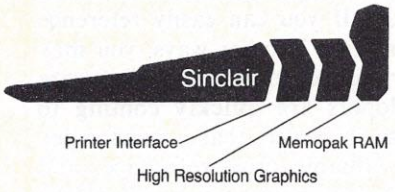

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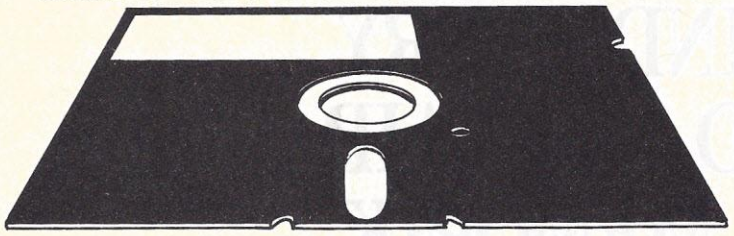

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short time you've just spent has been wisely invested.

The old adage "A picture is worth a thousand words" has probably never been truer than when it's used to describe technical information. Illustrations give you visual points of reference that allow you to "see" whether or not you are using the software correctly. Take note of the number of illustrations in the documentation. The odds are good that they'll speed the learning process along.

If the manual doesn't contain an extensive index, be sure the information you're going to reference can be easily found in other ways. Be a little suspicious of a manual that lacks an index, but don't necessarily let it become the deciding factor between one product that is somewhat preferable to another. The index is the last section to be written and seems to get lost in the shuffle when a company is in a hurry to get a good product to the market. If you can easily reference information in other ways, you may never use the index anyway. Software developers are quickly coming to realize, however, that a good index is a valuable cross-reference, and they're developing better ones all the time.

The table of contents may seem insignificant to most. If you can easily make your way around the manual without it, it will probably be insignificant to you.

Software developers promise that documentation will continue to improve. More than ever before, they are committed to professional, easy-to-use packages. Many innovative developments are under experimentation. Already, some vendors are using the computer itself to communicate the needed information about the program. Others promise the use of high-resolution graphics with their on-line documentation.

For now, most of the manuals are on paper. But there are ways to wade through those pages and select just what you need.

The reason you bought a computer in the first place.

The General Manager

The Agony... You expected your new computer to perform miracles — to bring order out of chaos. You looked for it to organize and manage your business information. You looked forward to the end of errors, the end of frustration . . . and the saving of time, effort and money. Afterall, that's the reason you invested in a computer in the first place. Yet, there it sits. Nothing.

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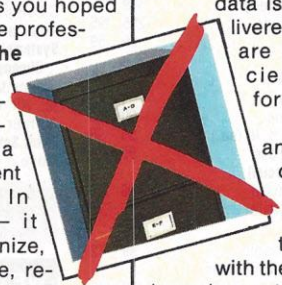

The General Manager is what the computer industry calls a data base management program (DBM). In everyday words — it allows you to organize, store, file, find, save, retreive, interrelate, control and print out all or selected parts of your information. The result: your information, or data, is managed totally, completely, automatically.

Ordinary

The ordinary DBM system expects your business to conform to its program design. So you must change your records, your forms, your way of having information cross-referenced, saved and . . . well, you almost end up with a different business! Certainly a more frustrating one.

Extraordinary

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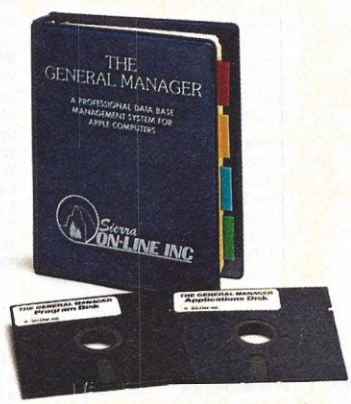

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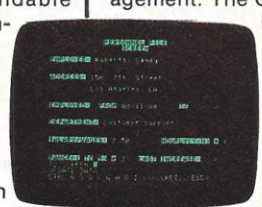

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DONALD MCCUNN
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527 pp., $34.95; $24.95 paperback

Probably the most common use of the personal computer is for word processing, and it's no surprise that virtually every manufacturer offers a word-processing package. Some of the most successful independently produced programs, such as Electric Pencil and WordStar, are quite sophisticated. Similarly, there appears to be no shortage of sophisticated books on the topic. *Write, Edit, & Print* is, quite possibly, the weightiest tome, to date, on word processing, but it's also one of the most practical.

Rather than analyze existing word-processing packages, Donald McCunn has developed his own BASIC program. He has further produced program variations for the Apple II, the IBM Personal Computer, the Commodore CBM, and the TRS-80 Microcomputer Models I and III. The programs are written in Microsoft-compatible BASIC and can easily be adapted to run on any computer that uses BASIC-80 under the CP/M operating system.

The book is weighty because the author, a consultant and adult-education teacher, has tried to cover every possible base for the novice. About one-third of the book is a primer on computers, printers, and the BASIC language. Another third is devoted to a step-by-step development of the author's word-processing package, the Word Worker programs. The remainder of the book is an operator's manual for the programs.

Although the book deals only with the word-processing programs that form part of the Word Worker system, the author includes seven of his own linked programs for handling mailing lists, tables, and charts and graphs; for communicating with other personal computers; and for typesetting computer-prepared text. Evidently, more books will be written on these subjects.

The first part of *Write, Edit, & Print* may be of interest to anyone contemplating the purchase of a personal computer, but the information given is sketchy. No attempt is made to rank the computers described. Of more interest is the extended section on both dot-matrix and daisywheel printers. For anyone who wants to do serious word processing, the selection of a printer is a critical task. The book's coverage of some of the more well-known printers is good, but at the rate of introduction of new printers, it's likely to be outdated soon.

Similarly, the primer on BASIC is limited. The author prefers to spend several pages on instructions that require modification for the different types of BASIC. The reader who wants to fully understand the Word Worker programs should have a familiarity with BASIC or should first read a book, such as David Lien's *Learning TRS-80 BASIC for Mod-*

els I, II/16, and III (Compusoft Publishing Co., 1982).

The description and development of the word-processing programs are handled in an excellent step-by-step manner that encourages the reader to type in the programs and so build his own word-processing system. The author told me that despite the relatively low prices for his disks, many readers seem to prefer to type in the programs. That's testimony to the clear way the author has explained his program development. But the prospect of typing and debugging several hundred BASIC instructions would be a little daunting for me, to say nothing of the time consumed.

The four programs that comprise the word-processing system—a basic program for processing short documents, an extended writing program for long documents, an extended printing program for long documents, and an editing program for making extensive text changes—are well done. An extensive menu format with questions for options leads the novice easily through the programs. The more advanced user, however, soon becomes tired of working through menu screens. Fortunately, reference to the book will allow the experienced user to make program modifications to reduce screen usage and questions.

For short documents, such as letters and memos, the programs are good. But since the programs are written in BASIC, they can be slow when justifying or reformatting long documents. A more significant disadvantage lies in the nature of these BASIC programs. They are line-oriented, and editing proceeds by line number rather than by the faster and easier full-screen cursor movement of a screen-oriented word processor. Line editing works well when editing the BASIC programs themselves, but is very frustrating when editing long documents.

For the user who can live with line orientation, however, the Word Worker programs offer the opportunity to develop a personalized word-processing system. The extended printing program, in particular, is considerably more flexible than the printing routines of many word processors, and the directory feature is several steps ahead of that of Scripsit, Radio Shack's program. If McCunn's mailing-list and typesetting programs are as good as his word-processing programs, the complete system will be formidable indeed. Now if he would only produce a small, spiral-bound operator's guide instead of this thick book . . .

—*Jeffrey Bairstow*

You can't judge a book by its title

THE ILLUSTRATED WORD PROCESSING DICTIONARY
RUSSELL A. STULTZ
PRENTICE-HALL, INC.
ENGLEWOOD CLIFFS, NJ
170 pp., $17.95; $10.95 paperback

Where *Write, Edit, & Print* sometimes overwhelms by excess, this book totally underwhelms by its paucity of useful information. *The Illustrated Word Processing Dictionary* is simply not a dictionary, at least not in the typical sense, nor is it illustrated, except by some attempts at line drawings of display screens.

What Russell Stultz has tried to do is write an operator's manual for generic word-processing systems. The manuals of many word processors read better than this book and are considerably more informative. I suppose the book might find a place in the library of a secretarial school, but it is certainly not to be recommended for personal-computer users.

—*Jeffrey Bairstow*

(continued on page 153)

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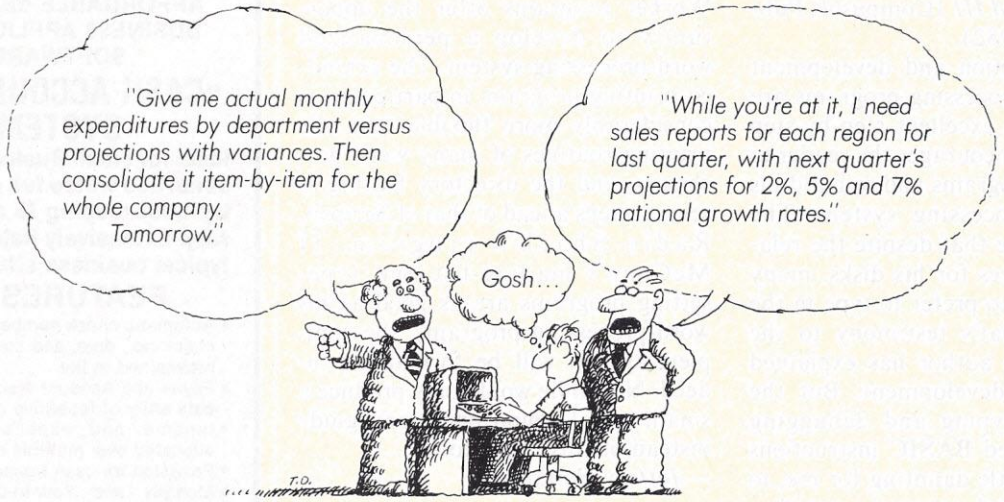

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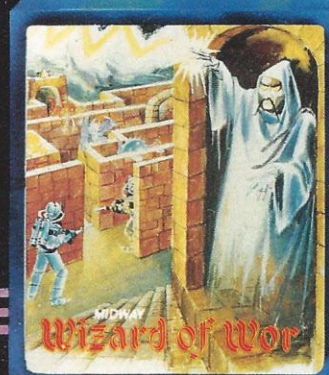

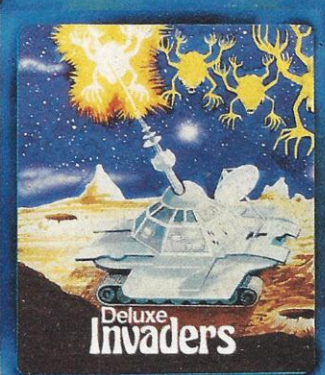

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(continued from page 149)

How to keep that information private

CODES, CIPHERS AND COMPUTERS: AN INTRODUCTION TO INFORMATION SECURITY
BRUCE BOSWORTH
HAYDEN BOOK CO.
ROCHELLE PARK, NJ
259 pp., $13.95

"What the minds of men can conceive," G. Gordon Liddy once said, "the minds of other men can deceive." Therefore, when using ciphers to protect confidential computer files, it should be as difficult as possible to break them. An excellent way for the advanced reader to learn this is to read *Codes, Ciphers and Computers*, by Bruce Bosworth, a professor of quantitative analysis at St. Johns University in New York. The book provides a solid foundation and good working knowledge of how to use computer-generated ciphers to protect valuable data.

While most books on computer security deal with elaborate and usually expensive methods of protecting information, Bosworth's guide does not. Instead, the author describes more than 80 BASIC programs that generate ciphers. As Bosworth explains, "Cryptography can provide a high degree of security at a minimum cost." Further, the programs in the book are easy to follow and use, but they are sophisticated enough to foil all but the most determined code breakers.

Bosworth notes the derivation of the word "cryptography": In Greek, "kryptos" means "hidden" and "graphein" means "to write." Thus it is the science of secret writing. Similarly, cryptanalysis involves breaking ciphers when there is little or no knowledge about the system or key used to generate it.

The author cautions against using initials, birth dates, anniversaries, or similar combinations as keys for cipher programs. He recommends instead that computer-generated random dictionaries be used because, "This makes breaking the code a very difficult task and thus provides greater security." He cautions, though, that even pseudo random-number generators can "produce a predictable pattern which may decrease the power of your key."

Some advanced technical detail is included about how and why the cipher programs work, and flow charts of most programs complement the text. Among the cipher programs discussed in the book are those for ASCII Cipher Systems; Caesar Ciphers; Decimated Alphabet Ciphers; and Monoalphabetic, Polyalphabetic, and Digraphic Substitution. Bosworth further describes how and why the Data Encryption Standards and the Data Encryption Algorithms (DES/DEA) work. The algorithms, which use a code 64 bits long, were developed for the National Bureau of Standards, and there is still debate over how secure they are.

A word of warning: If you decide to implement some of Bosworth's cipher programs, it would be best not to bring the guide to the office.
—*Roy Katz*

Is it time to trade up to real programming?

A BASIC PROGRAMMER'S GUIDE TO PASCAL
MARK J. BORGERSON
JOHN WILEY & SONS
NEW YORK, NY
118 pp., $9.95

The fundamental idea of this book is so good that one wonders why it has not been done before. Almost all personal-computer users

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CIRCLE 56

learn how to program in BASIC, but very few outside the ranks of professional programmers progress to more sophisticated programming languages like Pascal. Mark Borgerson is to be congratulated on his bright idea and on its successful implementation in *A BASIC Programmer's Guide to Pascal*.

Among computer scientists, Pascal is referred to as a "structured" programming language, which means it has a well-defined format and a precise design. Pascal programs consist of blocks of code that are independent of the program in which they are used. Consequently, Pascal routines can be used in many programs without change. It is this building-block design that gives Pascal (and certain other high-level programming languages) its structure. BASIC, with its line orientation, is far less structured.

Partly due to its formality, Pascal is probably more time-consuming to learn than BASIC, and is certainly more difficult to implement on personal computers. Now that the Pascal compiler (UCSD Pascal) developed by the University of California at San Diego is widely available for most personal computers, however, the time is ripe for this book. Unfortunately, the full UCSD Pascal system sells for several hundred dollars, an inhibiting factor for most of us. But if you write large programs that run slowly under BASIC, a move to Pascal may be in order; and Borgerson's book is an excellent place to start, even before you buy a Pascal compiler.

This book is not a manual. It is an easily digestible introduction to the Pascal language that should be used as a transition to the UCSD manuals which can be intimidating to a BASIC programmer. Not only does the book cover the main features of Pascal, but the author gives many routines that the novice Pascal programmer will find useful when building programs. In fact, the book is a

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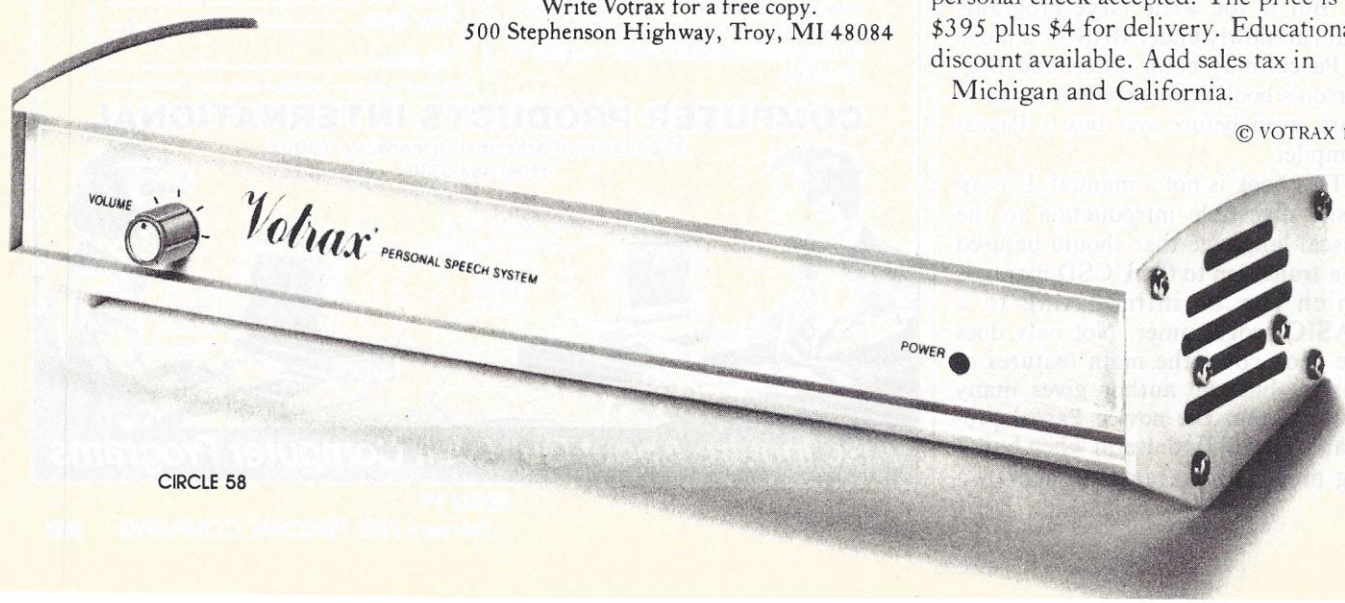

CIRCLE 58

good start toward developing a library of Pascal routines.

One word of caution: Applesoft BASIC, as written for the Apple II, is used for comparison in the book. While Applesoft is a version of Microsoft BASIC, there are some important differences, particularly in the treatment of string variables and input/output statements for disks. If you are not familiar with Applesoft, parts of this book may be confusing.
—*Jeffrey Bairstow*

Future shocks

COMMUNICATIONS AND THE FUTURE: PROSPECTS, PROMISES AND PROBLEMS
HOWARD F. DIDSBURY JR., ED.
WORLD FUTURE SOCIETY
BETHESDA, MD
357 pp., $14.50

"The growth opportunities of the future may not lie with General Motors, Exxon or even IBM," writes William Halal, a professor of management at George Washington University, "but with the countless small new information-related firms like Apple, Genentech and Wang." This is one of many interesting observations and predictions in *Communications and the Future*, a collection of papers presented at the World Future Society's Fourth General Assembly last summer in Washington, D.C.

In Professor Halal's essay, "Information Technology and the Flowering Enterprise," he explains the reason for his projections. Halal states that almost all new job formations have come directly from small firms rather than large corporations. However, he also points out that a few large companies, such as 3M Corporation, actively "encour-

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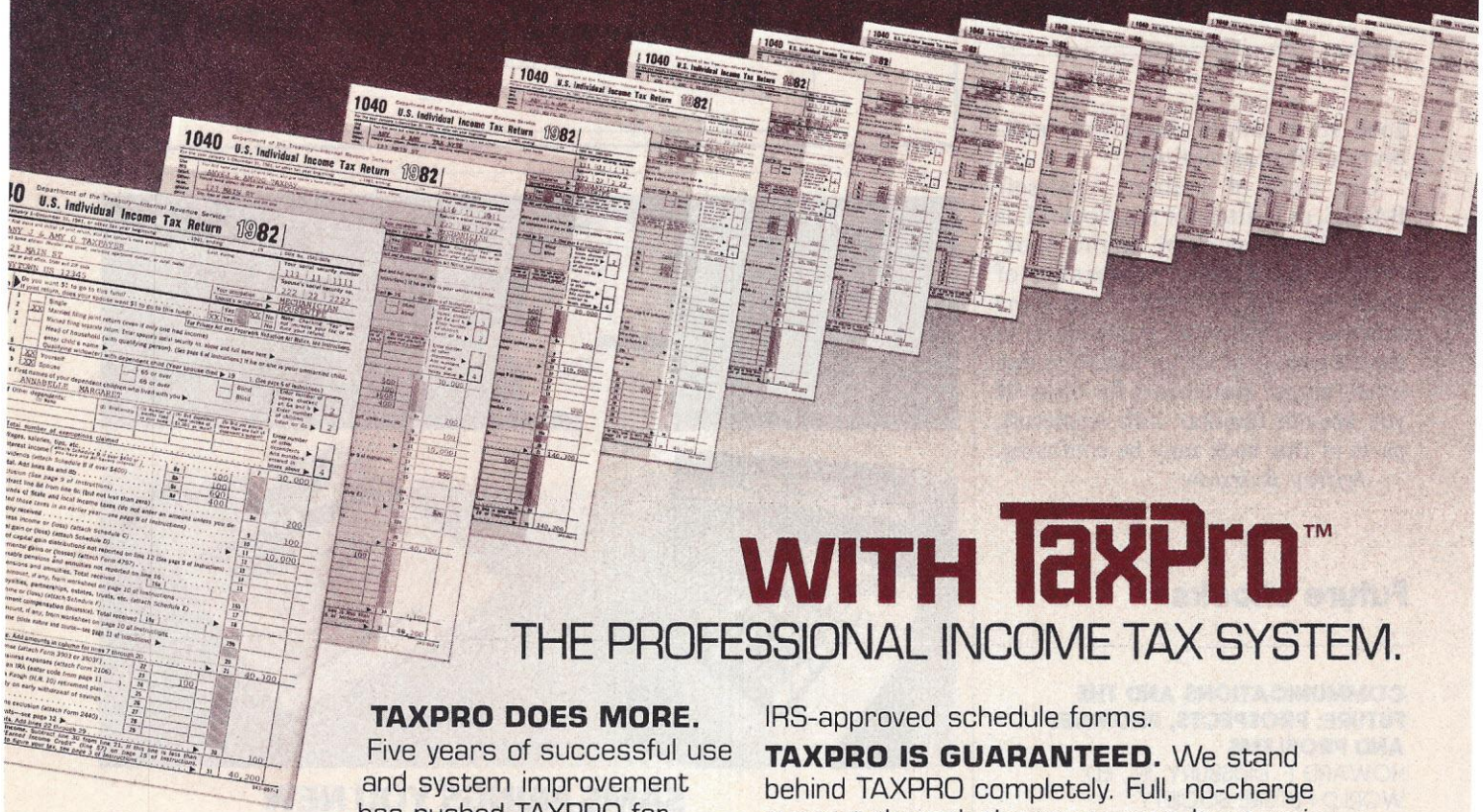

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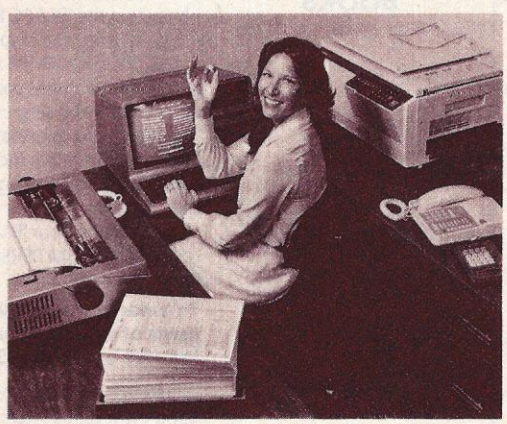

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CIRCLE 127

BOOK REVIEWS

age employees to form new projects and start small businesses."

In another essay, Fred Harcleroad, a professor at the University of Arizona, predicts that a future computer chip will hold one million bits of data in the same space as today's 64k chip. He envisions "basketball-size mainframe computers which could exceed current large computers in capacity." Harcleroad also points out that home computers in the very near future will have larger memories, be less expensive and "be coupled with video disks, video tapes, satellite transmission of sound motion pictures, and work on interactive keyboards, light pen or by voice." In other words, personal computers will soon be able to meet all of a family's entertainment and information needs.

Jerry Salvaggio, a professor in the School of Communications at the University of Houston, has written the book's most perceptive essay, "An Assessment of Japan as an Information Society in the 1980s." Salvaggio says that by the year 2000 Japan will be "the most informationalized society on earth and will have pulled ahead of the United States and other developed countries in the systematic development of communications technology." Salvaggio estimates that by 1990 Japan's share of the world computer market will be 30 percent and it will have captured an astounding 18-percent share of the American market. The reason for this growth, Salvaggio explains, is deceptively simple: "Few countries in the Western world have taken the concept of informatization so seriously as Japan."

Reading *Communications and the Future* takes the reader on an exciting journey into the technology, economics, education and society of the near future. The statement that best sums up what will determine the future is written by Harlan Cleveland, Director of the Hubert Humphrey Institute of Public Affairs in Minnesota. He says: "There are the

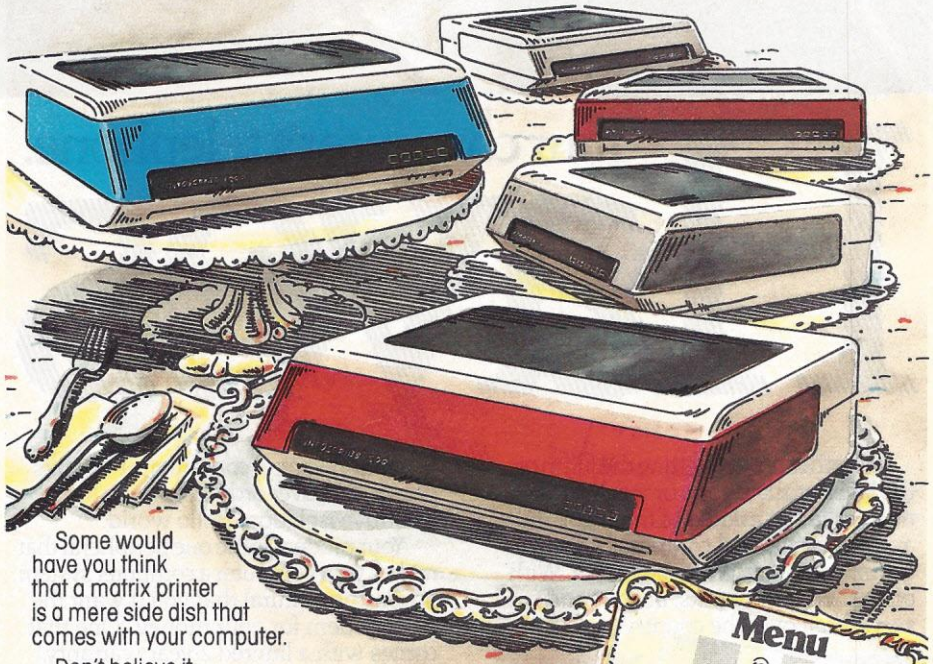
COMING IN FUTURE ISSUES

Home Control

Imagine, if you will, the smart home of the future. It's a place where coffee is brewed before you're out of bed, where energy isn't wasted, where the lawn is watered every time the green begins to turn to brown, where all your banking is automatic. And the best part of it is that it all gets done without you every turning a hand!

Pie in the sky? Not on your life. Smart homes are a reality right now, and if your fondest wish is for a home that does it all, don't miss this words-and-pictures story of how two men did it with their personal computers—and how you can follow suit.

Soup to Nuts.



Some would have you think that a matrix printer is a mere side dish that comes with your computer.

Don't believe it.

What you get out of your printer is what you get out of your computer. If your printer is small, slow, noisy or unreliable, your computer will be limited, sluggish, irritating, or inoperable. Just telling it like it is.

That's why Infoscribe has come up with a gourmet line of multifunction matrix printers specifically for business and professional users.

You can switch from high-speed data processing to business letters, at will; handle up to 16-inch-wide paper; make up to five crisp carbons; generate gorgeous graphics in up to eight colors; and enjoy truly elegant and incredibly quiet operation, day-in and day-out.

Menu

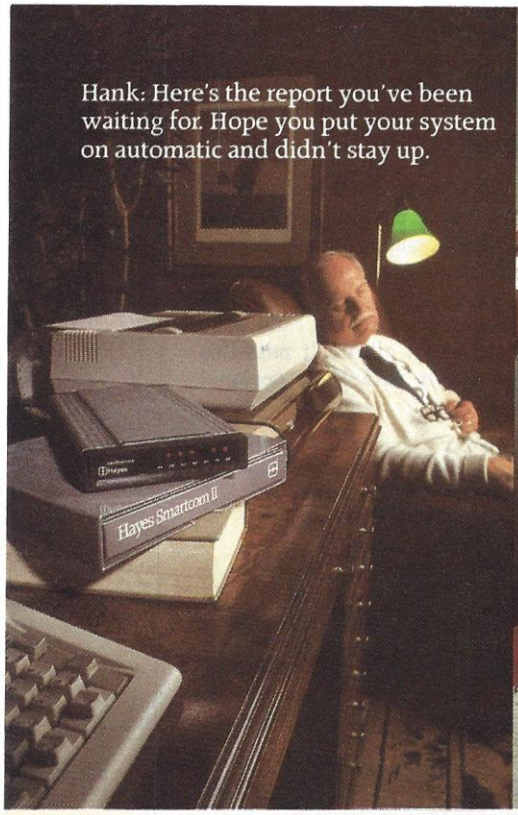
MODEL	DRAFT (CPS)	CORRESPONDENCE (CPS)	LETTERS (CPS)	GRAPHICS (72 x 72)	GRAPHICS (144 x 144)	PROGRAMMABLE FONTS	COLOR
500	150	75					
1000	200	100		X		X	
1100	200	100	40	X	X	X	
1200	200	100	40	X	X	X	X
1500	400	200		X		X	

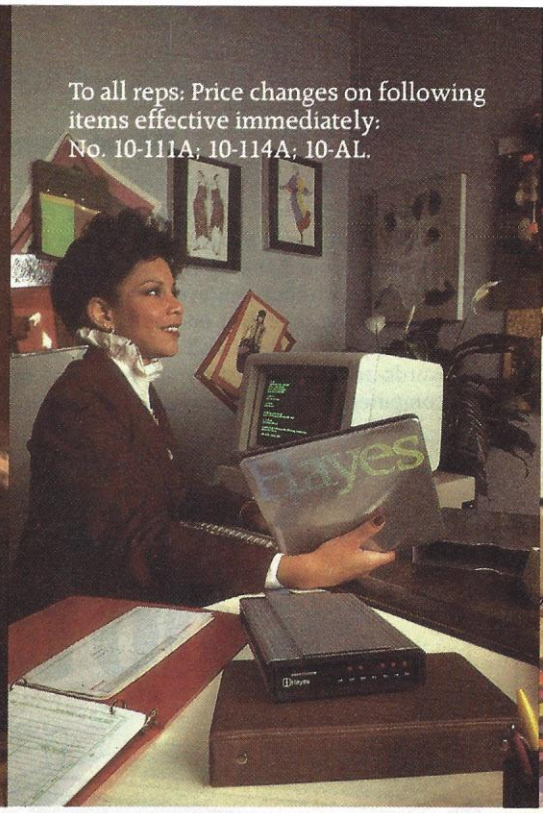
Check the menu for the printer that meets your exact needs. Why go with the computer manufacturer's combo plate when the same money will let you buy Infoscribe, a la carte?

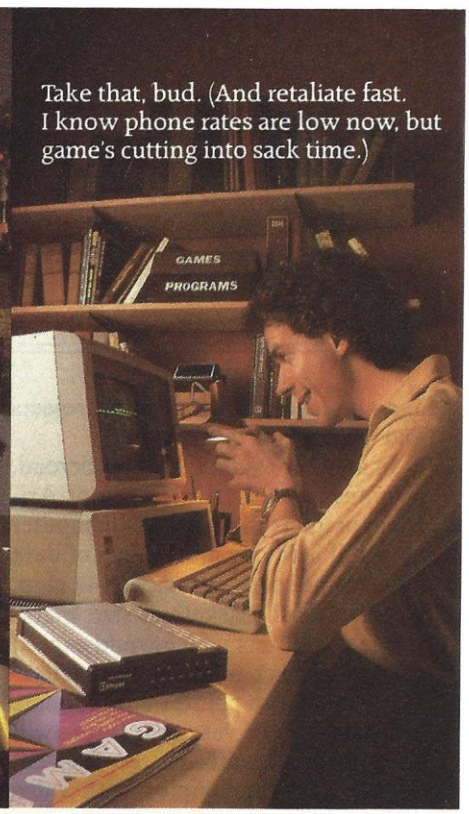
Your favorite computer dealer or systems specialist will be delighted to arrange a demonstration for you. Or contact the *matrix d'*: Infoscribe, 2720 South Croddy Way, Santa Ana, California 92704, USA, Phone (714) 641-8595, Telex 692422.

PRINT WITH INFOSCRIBE

CIRCLE 62

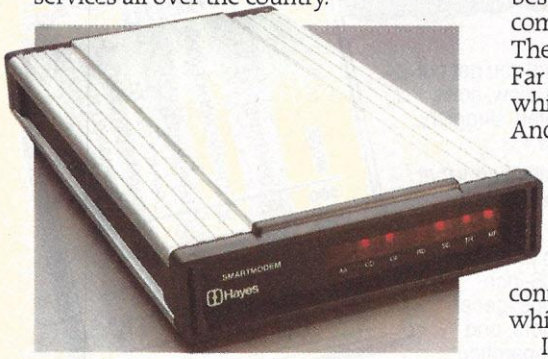






Hayes Your computer's telephone.

Whether they're getting the jump on the latest stock reports or waging galactic wars in the middle of the night, more and more personal computer users are *communicating.* With each other. With offices. With networks, utilities and mail services all over the country.



And Hayes is providing the communications link: A first-rate telecomputing system that combines an intelligent RS-232 connect modem with a sophisticated, easy-to-use communications program.

The Smartmodem 300. Think of it as your computer's telephone. Just plug it into any phone jack, and the Smartmodem 300 sends messages to and from your personal computer, at 300 bits per second, over ordinary phone lines. Goodbye isolation. Hello world.

Your modem is the one peripheral that makes your computer a computer *system.* So it's only natural that you'd want the best modem for your money. (One that comes with a limited 2-year warranty.) The Smartmodem 300 is a wise choice. Far superior to acoustic coupler modems, which connect to the telephone receiver. And it's so easy to use.

It dials, answers and disconnects calls automatically, operating with rotary dials, Touch-Tone* and key-set systems. Plus it works at full or half duplex, which simply means that connecting to a time-sharing system, while it is a big deal, is no big deal to do.

Indicator lights let you see what your Smartmodem is doing, while an audio speaker lets you hear it. (Is the remote system down, or was the line just busy? This way, you'll know.)

Now all these extras aren't absolutely necessary. We could have gotten by without them. But at Hayes, we're not satisfied with just "getting by." That's why we made the Smartmodem 300 so—well, smart. You can even program it. In fact, we've provided one for you.

Announcing Smartcom II.™ The communications program designed by Hayes specifically for the Smartmodem. If ever there was friendly software, the Smartcom II is it!

The first time out, you'll be creating messages, sending them, printing them and storing them to disk. Simultaneously.

Likewise, when you're on the receiving end. Only you really don't need to be. With Smartcom II and your Smartmodem 300, your computer does it all, completely unattended! That's especially helpful if you're sending work from home to the office, or vice versa.

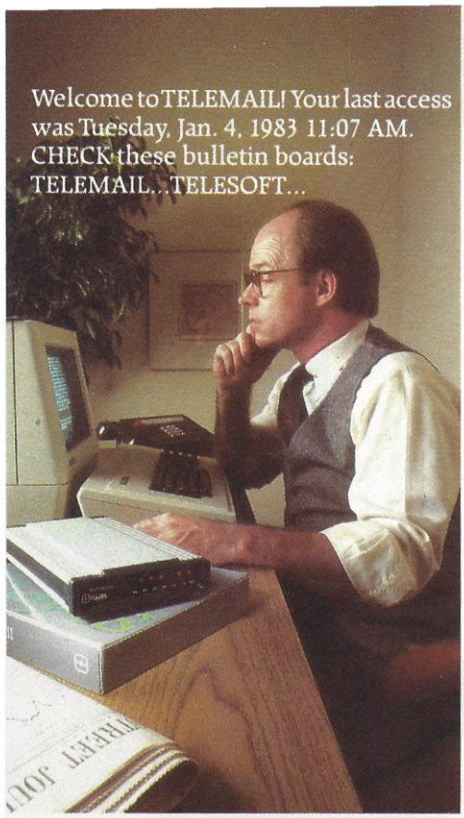
But it's just part of the story. For instance, before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once, the first time. After that, the information (called parameters) is stored in a directory on the Smartcom II. Calling or answering a system listed in the directory requires just a few quick keystrokes.

You can store lengthy log-on sequences the same way. Press one key, and the Smartcom II automatically executes a whole string of numbers to connect you to a utility or information service.

And if you need it, there's always "help." Even while you're on-line, the screen will display explanations about a

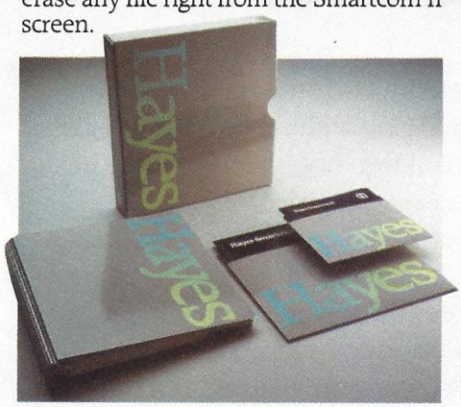
Hayes®

CIRCLE 63



prompt, message or parameter that will get you on your way in no time.

Smartcom II also provides a directory of the files stored on your disk. You can create, display, list, name, re-name or erase any file right from the Smartcom II screen.



And now Smartcom II is available for the IBM PCand Xerox 820-II†.**

Like all our products, Smartcom II and the Smartmodem 300 are backed by excellent documentation and full support from us to your dealer.

So see him today. Link up to the exciting world of telecomputing. Get a telephone for your computer.

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optimists, the visionaries—the people who, when confronted by the gloom and reluctance that are the hallmarks of expertise, are most inclined to ask, 'Why not?'"
—*Roy Katz*

Personal computer, meet the outside world

TRS-80 DATA COMMUNICATION SYSTEMS
FRANK J. DERFLER JR.
PRENTICE-HALL, INC.
ENGLEWOOD CLIFFS, NJ
159 pp., $12.95

As many computerists may have discovered, computer communication is no simple matter. Despite standards for electrical signals and data representation, there's more to data communications than merely hooking up a modem to a personal computer and picking up the phone. For the newcomer to data communications, Frank Derfler's little book is valuable reading.

Although parts of the book do relate to the TRS-80 product line, there is much here that could be useful to owners of other personal computers. In fact, my most serious criticism of the book is that the author didn't take the time to expand his material to cover a wider audience.

The book opens promisingly with a look at the fundamentals of computer communications. It does get bogged down, however, with an excessively detailed examination of a widget called a UART, a sort of electronic traffic cop (the acronym stands for Universal Asynchronous Receiver/Transmitter). The novice should skip this section and move on to the chapters on modems, which are nicely explained, and to those on using the TRS-80 as a terminal, which are well done with brief reviews of some of the better terminal software now on the market.

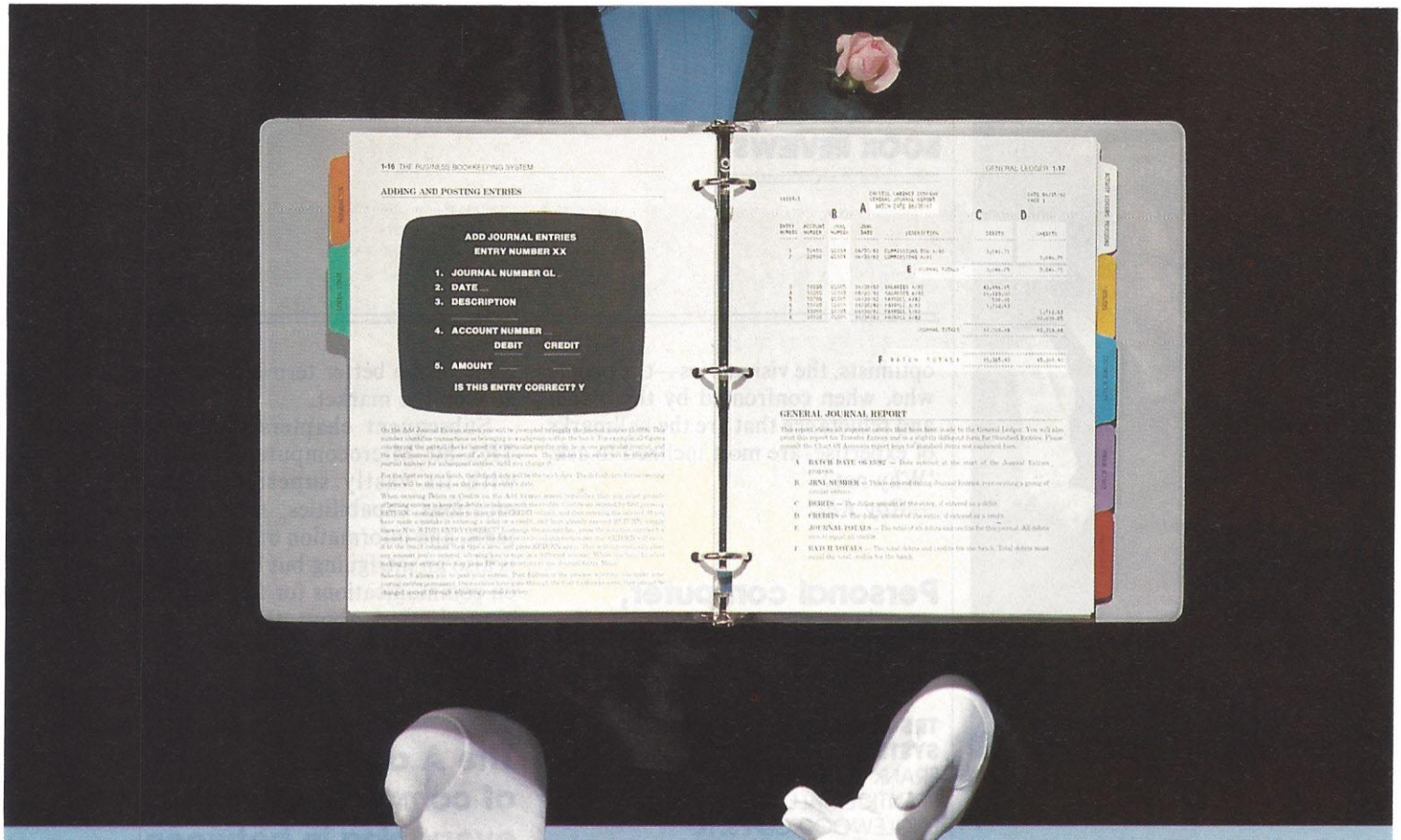
Subsequent chapters review the TRS-80 Microcomputer Model II with its vastly superior communications capabilities, message systems, and information utilities. There is also an intriguing but brief chapter on communications for the deaf, and a prediction about the future of personal-computer communications.
—*Jeffrey Bairstow*

The A and Z of computers, and everything in between

COMPUTERS IN SOCIETY
NANCY STERN AND
ROBERT A. STERN
PRENTICE-HALL, INC.
ENGLEWOOD CLIFFS, NJ
518 pp., $16.95

I sometimes feel that if all the books on computers that begin with "The abacus" and end with "The future of computing" were placed end to end, they would reach from the editorial offices of *Personal Computing* to the grave of Charles Babbage in England. Here's another such book, and it reads like the compilation of the course notes it surely is. And, as if that were not enough, the book is illustrated with the kinds of computer photos produced by public-relations firms, which bear little relation to real-life computer rooms.

No doubt the Sterns, both teachers at Long Island educational institutions, have put a prodigious amount of effort into *Computers in Society*. But the book adds nothing new to the discussion of the sociology of computers and their users. The book is clearly required reading for one or more of the authors' courses—and should be restricted to that audience.
—*Jeffrey Bairstow*



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CIRCLE 109

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Telephone: **(313) 397-0454**

CIRCLE 67

ANSWERS

(continued from page 21)

If a radio operator answered the phone, the modem wouldn't recognize a computer's carrier signal, and it will break the connection.

If you have a radio link, though, there should be no reason why you can't manually place the call and then connect the computer via an acoustic modem.

Since we don't know what your motor home's communication configuration is, we can only offer the above as a general answer. Another general answer is that as long as there are wire connections from the phone company to the motor home, any modem that works over the public dial-up network will work in your motor home. Be sure you notify the phone company of the presence of the modem on the line, as the FCC requires. Instructions for this notification should be in your modem operator's manual.

Q: What are LEDs, and what's a LED readout? I read about these things all the time, and I don't know what they are.

A: LED stands for light-emitting diode. A LED is a class of diode that gives off light when the diode is conducting.

That doesn't help much unless you know what a diode is. A diode is an electrical device that allows current to flow only one way. When the diode is a semiconductor device (it could be a vacuum-tube diode) it can be made to give off light if the diode is made up of the proper materials. LEDs are often made of gallium arsenide, as opposed to ordinary semiconductor diodes that are made of silicon or germanium.

When a diode is conducting, it is said to be forward biased. When a LED is forward biased, there is a current flowing across a part of the diode called the junction, a region where two dissimilar semiconductor materials are in contact. As the elec-

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CIRCLE 68

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CIRCLE 72

ANSWERS

trons flow across the junction, they exhibit behavior best explained by quantum theory, but if the materials are right, one of the things the electrons do is undergo an energy-level change of the proper magnitude to give off a photon, a particle of light. There are lots of electrons undergoing this change, and the sum of all of the energy-level changes is enough to make the diode look like it is continuously emitting light.

When a diode isn't conducting electricity, it's said to be reverse biased. A reverse-biased LED gives off no light, because there is no current flowing across the junction when the diode is reverse biased, hence there is no energy-level transition, and no photons emitted. So a LED is like a miniature light bulb and switch in one package. If you want it to give off light, you simply make the voltage at the anode, the positive contact, greater than the voltage at the cathode, the negative contact. If you don't want the LED to light, make the voltage at the cathode greater than the voltage at the anode.

LEDs are used in computers in two forms. Many computers and peripherals have LEDs mounted on front panels, to give some indication of operation or trouble. A lighted LED might mean, for instance, that a printer is on line, ready to receive data, while the same LED, unlighted, means the printer is not ready to print.

Red is the most common color of LEDs because it's the easiest color to get with the intensity that makes it easy to see. There are also green and yellow LEDs, and some blue, although blue has been a major challenge for the semiconductor companies.

LEDs can be made in a number of shapes and sizes. When they are made in the shape of bars, they can be combined into a LED display. These are usually 7-, 9-, or 16-segment displays. It takes seven bars arranged in a figure eight pattern to

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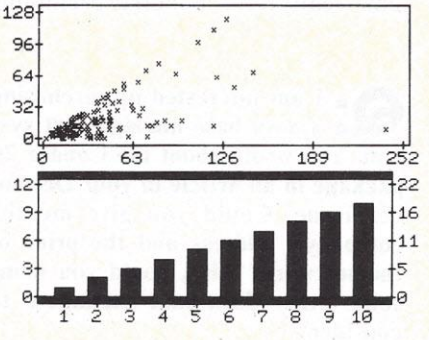
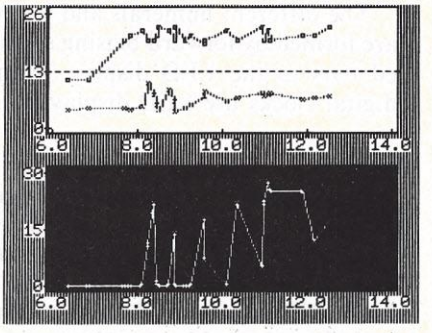
STATPRO allows easy access to its extensive numerical data capabilities.

The strength of STATPRO is found in the functions of its user friendly, menu-driven database. You can easily learn to enter and edit, manipulate, transform, and print out data. STATPRO's searching



capabilities allow these functions to be performed on all your data or a user defined subset of your data. Over 600 transformations and conversions are available. You can place the results of these transformations into the same field or any other field in STATPRO's database.



STATPRO offers a comprehensive collection of statistical procedures.

The statistics component of STATPRO contains a multitude of procedures, grouped into the following modules:

Descriptive: Contingency analysis, cross tabulation, normality tests; descriptive, comparative, range and non-parametric statistics.

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Multivariate: Principal components factor, orthogonal factor, oblique factor, pair-weighted cluster, discriminant function, multiple contingency, and canonical correlation analysis; positive definite inverse and determinant.

STATPRO provides graphic representation of your data in minutes.

STATPRO graphics plot *all* the results of your STATPRO statistical analyses including scatter, triangle, regression, and box plots; piecharts, histograms, and dendograms. Further, with STATPRO you can custom edit with keyboard, paddles or graphics tablet. You can create characters and shapes and place them anywhere on a graph. Mix text with data fields. Place multiple plots on each screen. Define your axis limits.

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STATPRO documentation wraps up the package.

Although STATPRO software is essentially self-documenting, complete print documentation is provided. This includes walk-through tutorials, easy to understand pocket reference guides and comprehensive user's guides.

STATPRO currently runs on the Apple® II and Apple III personal computers. It will soon be available for the IBM® PC.

Find out more about STATPRO: The Statistics and Graphics Database Program.

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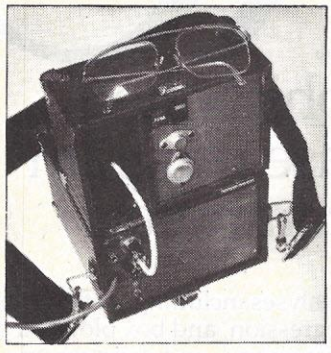

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CIRCLE 55

ANSWERS

represent all 10 digits (0 through 9). Nine segments gives a prettier display, while 16 segments are needed to display capital letters and numerals.

The different numerals and letters are formed by forward biasing selected bars in the LED display. Many digital clocks use LED displays.

Q: Is there an electronic typewriter that can be used with a TRS-80 Model III with 48k and two disk drives? I'm presently using a Model VII printer, but I want one that can be used as either a printer or an electronic typewriter.

A: You can use an electronic typewriter with your TRS-80, but you'll need both an interface card that makes sense of the signals which come from the computer and a cable to connect the typewriter to the computer.

There are several products on the market that will fill the bill. One that has been advertised in *Personal Computing* and other magazines is the Mediamix ETI2 from Mediamix (Los Angeles, Calif.). This product is a box that goes between the computer and an IBM electronic typewriter (and, the advertisements say, some other brands) and makes the typewriter function as a computer printer. The Mediamix ETI2 is available from Applied Creative Technology in Arlington, Tex.

Another interface we recently heard about is The Converter, from Vertical Data Systems (Mississauga, Ontario, Canada). This card is installed inside an Olivetti or IBM electronic typewriter and allows those products to type at speeds ranging from 175 to 230 words per minute. The Converter, its vendor says, is available with either RS-232-C serial or Centronics parallel interfaces. Both parallel and serial versions are available for the Olivetti ET121 or ET221 typewriters, while the serial version is available for the IBM models 50, 60, or 75.

Q: When I bought my NEC PC-8023A printer, I was shocked to discover that no cable came with the machine. The dealer wanted to charge me $45 to make up a custom cable to connect it with my system, an Apple II with a Mountain Computer CPS card for a printer interface. What gives?

A: Makers of peripherals like printers and modems can't supply cables with their machines, due to the lack of standardization in the industry. Even the well-known RS-232 interface standard is just loose enough so that two devices with RS-232 ports may not be able to "talk" to each other without a special cable that switches around several pinouts. (Pinouts are the signal functions assigned to each pin on a plug.)

However, most makers—including Mountain Computer—manufacture cables to connect their interface cards to various peripheral devices. The problem is that many dealers don't stock these cables, which Mountain lists at $25 each. Instead, the dealer may make the customer wait for a cable—or he may make one up on the premises (no big problem, really) for a hefty premium.

Q: I am interested in purchasing a data-base management system. You wrote about the Condor 20 package in an article in your December issue. Could you give me the company's address and the price of the software? Also, could you name some other data-base managers to consider?

A: The Condor 20 package is put out by Condor Computer Corporation; 2051 South State; Ann Arbor, Mich. 48104. The software costs from $295 to $995, depending on how extensive a program you need. While we are making no recommendations, some other popular data-base management software packages are: DB Master from Stoneware (San Rafael,

(continued on page 170)

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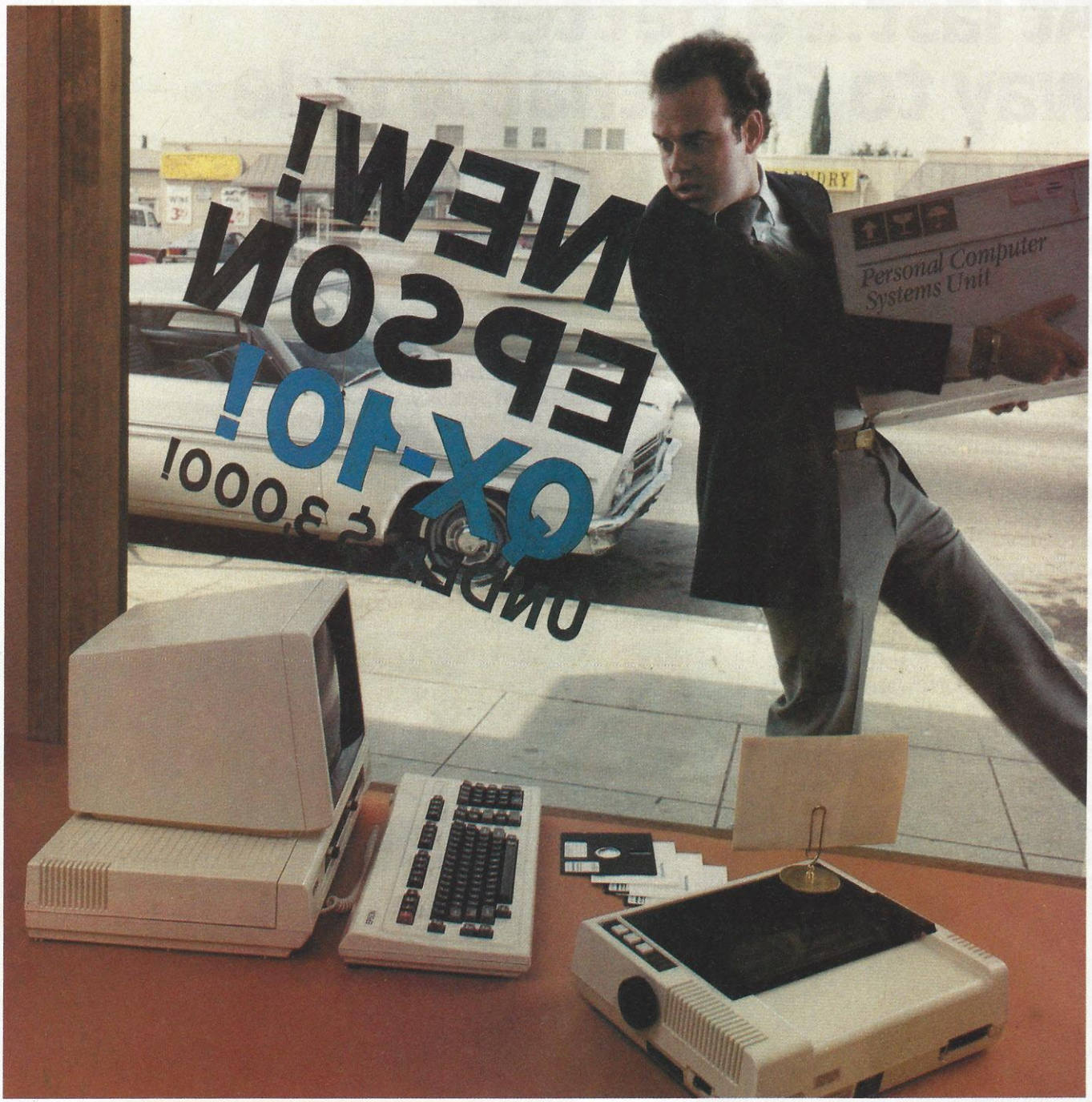

If you just bought another computer, boy are you gonna be sorry.

Epson.

The new Epson QX-10 is unlike any personal computer you've ever seen. It's a computer for people who don't have the time to learn computers; a computer you can be using within minutes.

And fortunately, you don't have to take our word for it. Here's how *Byte*, one of the computer industry's most prestigious magazines, describes the QX-10.

The first anybody-can-use-it computer.

"The Epson QX-10 (is) a computer for less than $3000 that may well be the first of a new breed of anybody-can-use-it 'appliance' computers ... In addition to being a highly integrated word processing/computer system that offers as much usable processing power as almost any existing microcomputer, the QX-10 ... system is designed to be used by people with minimal technical knowledge. We've certainly heard that claim before, but Epson has delivered on this promise in a way and to an extent that *no* microcomputer manufacturer has done."

That's nice to hear from a magazine like *Byte*, of course, but it doesn't surprise us. It's just what we intended the QX-10 to be all along.

More computer. Less money.

But useability isn't the only thing the QX-10 has going for it. As *Byte* says, "the QX-10 gives you a great deal for your money.

"Help is available at any time through the HASCI (Human Application Standard Computer Interface) keyboard Help key ... Text can be entered at any time just as you would in a conventional word processor. The Calc key turns the system into a basic 4-function calculator. Graphics can be created via the Draw key. The Sched (schedule) key gives you access to a computer-kept appointment book, a built-in clock/timer/alarm, and an event scheduler."

Advanced hardware for advanced software.

As for hardware, *Popular Computing*, another industry leader, says: "The QX-10 includes ... a number of advanced hardware features ... The basic components of the system are a detachable keyboard, a high resolution monochrome display, and a system unit containing two 5¼ inch disk drives. The drives use double-sided, double-density disks (340K bytes per disk) and are amazingly compact ... The QX-10 uses an 8-bit Z80A microprocessor. The system contains 256 bytes of RAM. Some of the RAM is ... battery powered ... which lets the computer retain information when the power is off."

You won't have to wait much longer.

The new Epson QX-10 may very well be the computer you've been waiting for. And fortunately, you won't have to wait much longer — it will be appearing soon in computer stores all across the country. In the meantime, write Epson at 3415 Kashiwa Street, Torrance, CA 90505, or call (213) 539-9140. We'll be happy to send you copies of our reviews.

After all, as *Popular Computing* puts it, the QX-10 will "do for computing what the Model T did for transportation."

And we couldn't have said it better ourselves.

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CIRCLE 77

ANSWERS

(continued from page 166)

Calif.); Personal Filing System from Software Publishing (Mountain View, Calif.); Data Factory from Micro Lab (Highland Park, Ill.); dBase II from Ashton-Tate (Culver City, Calif.); Datastar from MicroPro International (San Rafael, Calif.); and Datalink from Link Systems (Santa Monica, Calif.).

GEMS OF WISDOM

What Spellbinder Didn't Tell Me

My Spellbinder word-processing system, it seems, will do almost anything. But once I grew confident enough to drop the on-screen help messages, I suddenly had a problem. Spellbinder's documentation gives me two options: I can drop the on-screen help messages each time I execute Spellbinder, and recall them at will if needed; or I can reconfigure the system to drop the messages permanently. The first option is a nuisance. The second is a handicap because reconfiguring the system deletes the help messages from printing format tables where they are almost always needed.

There is, however, a solution not suggested by the manufacturer: Execute Spellbinder,'execute command "HE0" to drop the help messages, exit to the operating system with an "X" command, and execute a "SAVE nn SB.COM" command as though changing Y or Z table defaults. When Spellbinder comes up in the future, the on-screen messages will be absent. They will be present, however, on the print format tables, and they can be recalled to the screen with a "HE0" command, if needed.

James M. Ennes Jr.
WOODINVILLE, WA

This Gem of Wisdom wins $25 for James Ennes. If you have an anecdote, a tip, a secret to share, send it (up to 250 words) to Gems of Wisdom Editor, Personal Computing, *50 Essex St., Rochelle Park, NJ 07662.*

Deciding Which Computer to Buy

Of the 1.9 million people who bought small computers last year, over 20,000 of them bought the wrong computer for their needs. And no wonder. New products are introduced into the market at a breathtaking pace. The language question. The terminology problem -RAMs, ROMs, bits, bytes, bauds, protocols and processors. What's important? What's standard and what's optional? Even the dealers are confused.

To help you tackle this problem, we pulled together many of our sources -including leading experts in the field, manufacturers, marketing analysts, computer dealers and customers. In addition, we utilized computer user groups, clubs and associations throughout the United States, contacts in Japan and numerous industry and business publications. **COMPUTER GUIDE 1983** is the natural result of learning from the knowledge and mistakes of more than one million people.

The following steps will help you with your computer shopping -whether you're buying your first computer, or updating the one you have. **COMPUTER GUIDE 1983** can help you make the right decision.

1. What is the computer to be used for?

You may want to use it for entertainment, financial planning, learning how to speak a foreign language, office work, drawing and many other tasks a computer does well. The possible uses of a computer are as varied as human activities.

2. Which program will do the best job?

There are thousands of application programs on the market to consider. It is the program that gives you the power to control the actions of the computer. You must choose the right application program.

The first section of **COMPUTER GUIDE 1983** surveys each of the application programs available with computers today. Similar programs are grouped together and compared -one against another. **COMPUTER GUIDE 1983** contains over 2,000 application programs, grouped in over 100 categories -including programs for accounting, management, professional uses, word processing, graphics, research, games, learning and special applications. Programs are described using comparison charts -listing for each application program: the program name, computer(s) and system configuration(s) required, the documentation available and the price.

COMPUTER GUIDE 1983 provides you with a quick and efficient way of deciding which application program and which computer and options for that computer can do the right job for you.

3. The language?

You cannot get a computer to do anything useful unless you know how to talk to it. This is no easy task. But, **COMPUTER GUIDE 1983** can help.

The second section of **COMPUTER GUIDE 1983** guides you in selecting the right language. Different dialects of languages are grouped in their generic category. The BASIC language, for example, is a generic name and has many dialects -including Microsoft Basic, Atari Basic, Basic Plus and Basic-80.

Each of these languages have their own machine requirements. **COMPUTER GUIDE 1983** provides the name, machine and machine requirements, documentation and price of over 500 dialects, for over 50 languages. **COMPUTER GUIDE 1983** helps you solve the language problem.

4. What about the machine?

Depending on your needs, there will probably be several computers still in the running. Now the decision is based on the guts of the machines (hardware). **COMPUTER GUIDE 1983** compares machine characteristics in an easy to follow format. You don't have to be an electrical engineer to make an intelligent decision.

The solution is to work top down and not to go any further down than is needed. Your uses for the computer determines which machine characteristics are important. **COMPUTER GUIDE 1983** divides the machine into five areas -the keyboard, video display, printer, other peripherals and I/O, processor and memory and direct access storage. These five areas correspond to your basic machine needs. For example, an accountant needs a keyboard with a numeric keypad; word processing requires a printer; games utilize a video display; a mathematician wants a very fast machine; lots of memory is best when using the LISP language; and so on, as the hardware combines with the application program to develop a complete computer system.

COMPUTER GUIDE 1983 contains machine descriptions for over 250 computer systems, produced by over 150 manufacturers. Information is displayed in spreadsheets -allowing you to get the information you need. You don't have to bother with extraneous details and cumbersome text. **COMPUTER GUIDE 1983** can accommodate millions of people in making the right decision, as varied as those decisions will be.

5. Where to buy the chosen computer system.

COMPUTER GUIDE 1983 lists hundreds of vendors, by geographical location, and by the products they sell. It also provides additional consumer information. The first ship date, the ship rate, the number installed to date, prices and what that includes, purchasing terms and warranties. **COMPUTER GUIDE 1983** contains the names, addresses and phone numbers of hundreds of manufacturers, dealers and stores throughout the United States.

No one wins when you buy the wrong computer or computer product. Make the right decision. Use **COMPUTER GUIDE 1983.**

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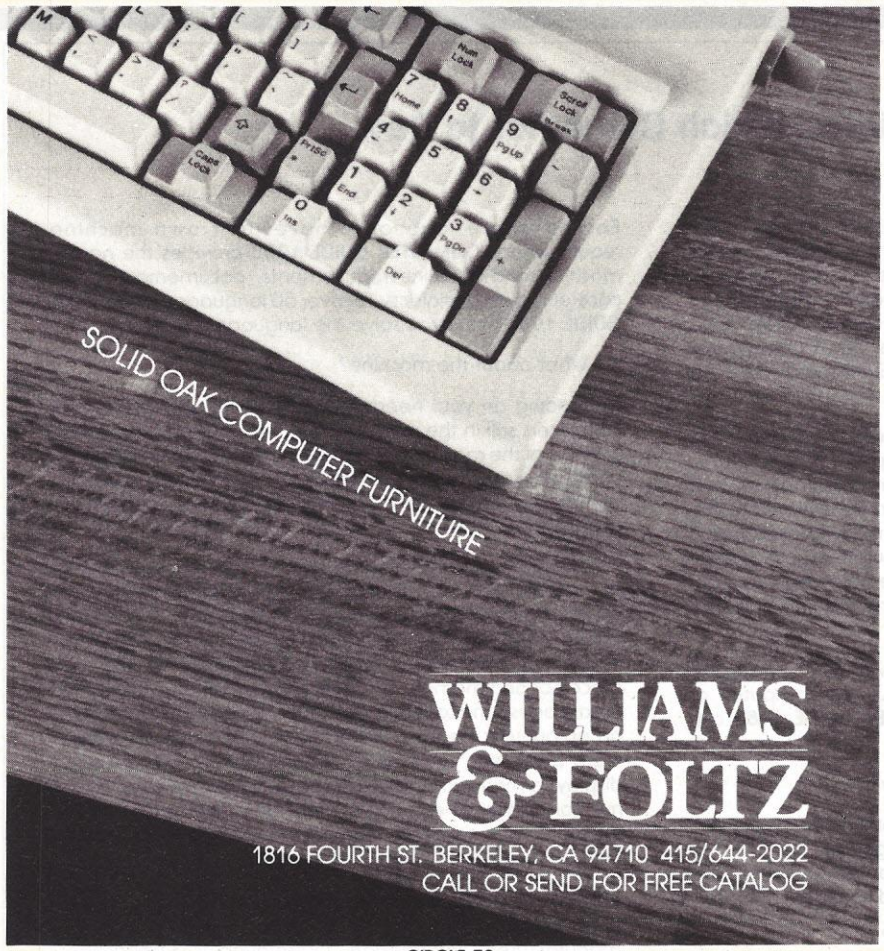

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CIRCLE 81

COMING IN FUTURE ISSUES

Home Control

Imagine, if you will, the smart home of the future. It's a place where coffee is brewed before you're out of bed, where energy isn't wasted, where the lawn is watered every time the green begins to turn to brown, where all your banking is automatic. And the best part of it is that it all gets done without you ever turning a hand!

Pie in the sky? Not on your life. Smart homes are a reality right now, and if your fondest wish is for a home that does it all, don't miss this words-and-pictures story of how two men did it with their personal computers—and how you can follow suit.

The Artful Computer

Science fiction writers wrote about it, movie directors splashed their idea of it onto film, and philosophers speculated about it.

What is it? Computer-produced art, of course. Our feature story documents the doings of two artists who are using their computers to canvass new worlds of artistic possibilities. Their work provides stunning proof that the computer—as a tool in the hands of a gifted artist—can produce the kind of art that opens new frontiers to man's imagination.

Down On The Farm

Out in Pocatello, Idaho, where America's golden grain fills the fields as far as the eye can see, one farmer is determined to make the best of his lot. He developed a way to manage his business with an Apple computer, an Epson MX-80 printer, B.P.I. accounting software, and VisiCalc.

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TRS-80 Model I

And In This Corner, Another Champion.....

TRS-80 Model III

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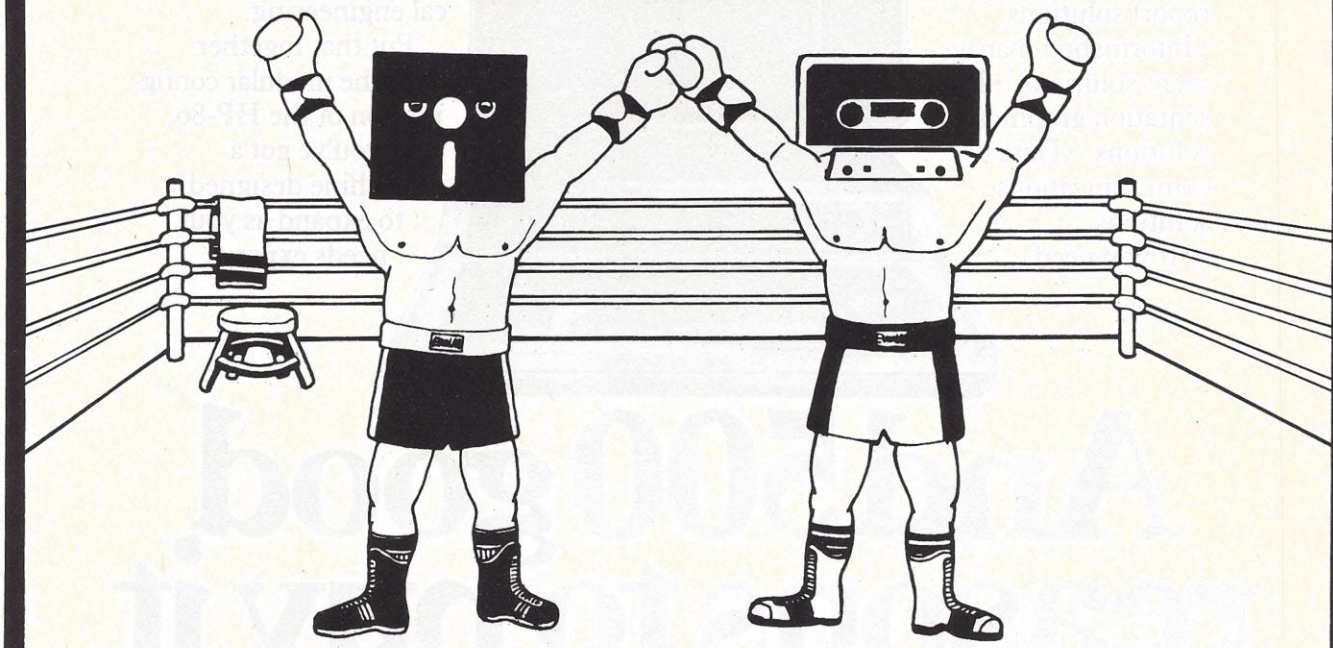

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CIRCLE 82

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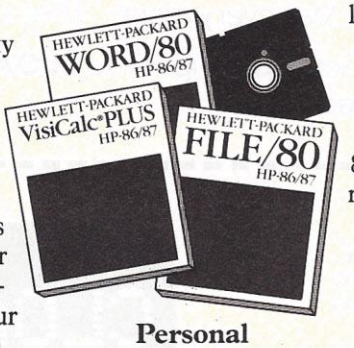

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CIRCLE 79

GEMS OF WISDOM

When "/" Can Be Fatal

Among the equipment in use at *Personal Computing* is an IBM Personal Computer, and one of the software programs we have for it is WordStar.

We were baffled the other morning when, after completing work on a lengthy new file, we tried to save it in the usual way with the command, "Control KD". We lost the whole thing and were rewarded with the words, "FATAL ERROR F27: DISK DIRECTORY FULL." The WordStar program was dumped and we were abruptly returned to DOS.

Disk directory full? That couldn't be. At that point, there were only 15 files on the data disk and there were some 297,984 bytes of disk space left. Nevertheless, we deleted a few files to make room and tried again. Same thing.

Next, we formatted a new data disk, opened the file again, entered a few lines, and tried to save it to disk. Again, that same message. Again, back to DOS.

We called the dealer who had sold us WordStar. He was baffled, too. Then we called our friends at MicroPro. "If you're using WordStar 3.2M with DOS 1.1," they said, "check for an illegal character in the file name—such as a forward slash." That's what we were using, and an illegal "/" was the culprit. We changed our file name from "EDIT/FEB" to "EDIT\FEB" and everything worked fine. We could have used virtually any punctuation mark or symbol between "EDIT" and "FEB" except "/". That's an illegal file-name character in DOS.

Moral: No matter what the software, no matter what the system, the operating system generally rules.

Paul Kellam
EDITOR
PERSONAL COMPUTING

This Gem of Wisdom doesn't win $25 for Paul Kellam, since he's already on the payroll. If you have an anecdote, a tip, a secret to share, send it (up to 250 words) to Gems of Wisdom Editor, Personal Computing, *50 Essex St., Rochelle Park, NJ 07662. If we can use it we'll pay you $25. Best of all, you'll be helping someone else with his personal computing.*

COMING IN FUTURE ISSUES

Rural Discovery

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CIRCLE 84

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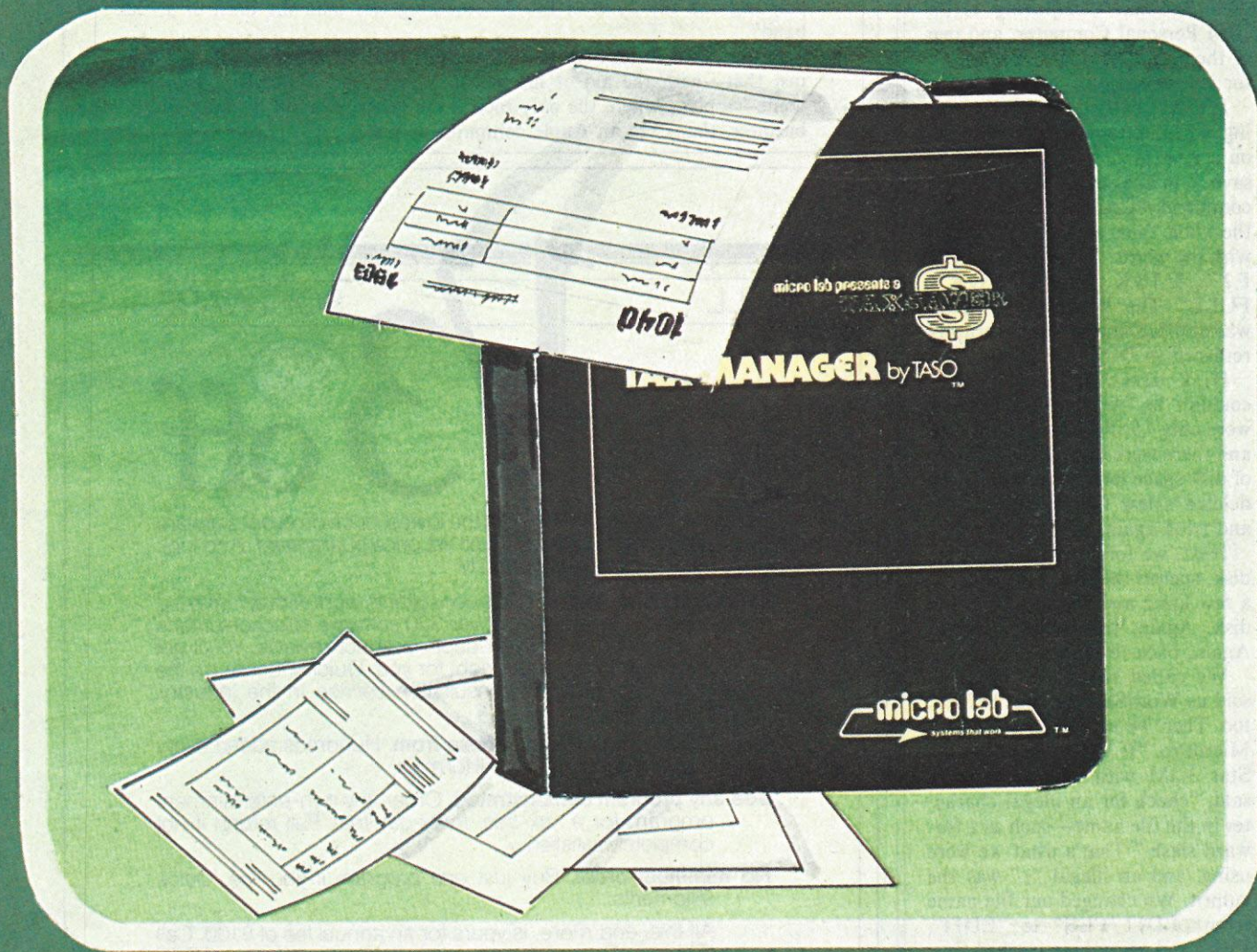

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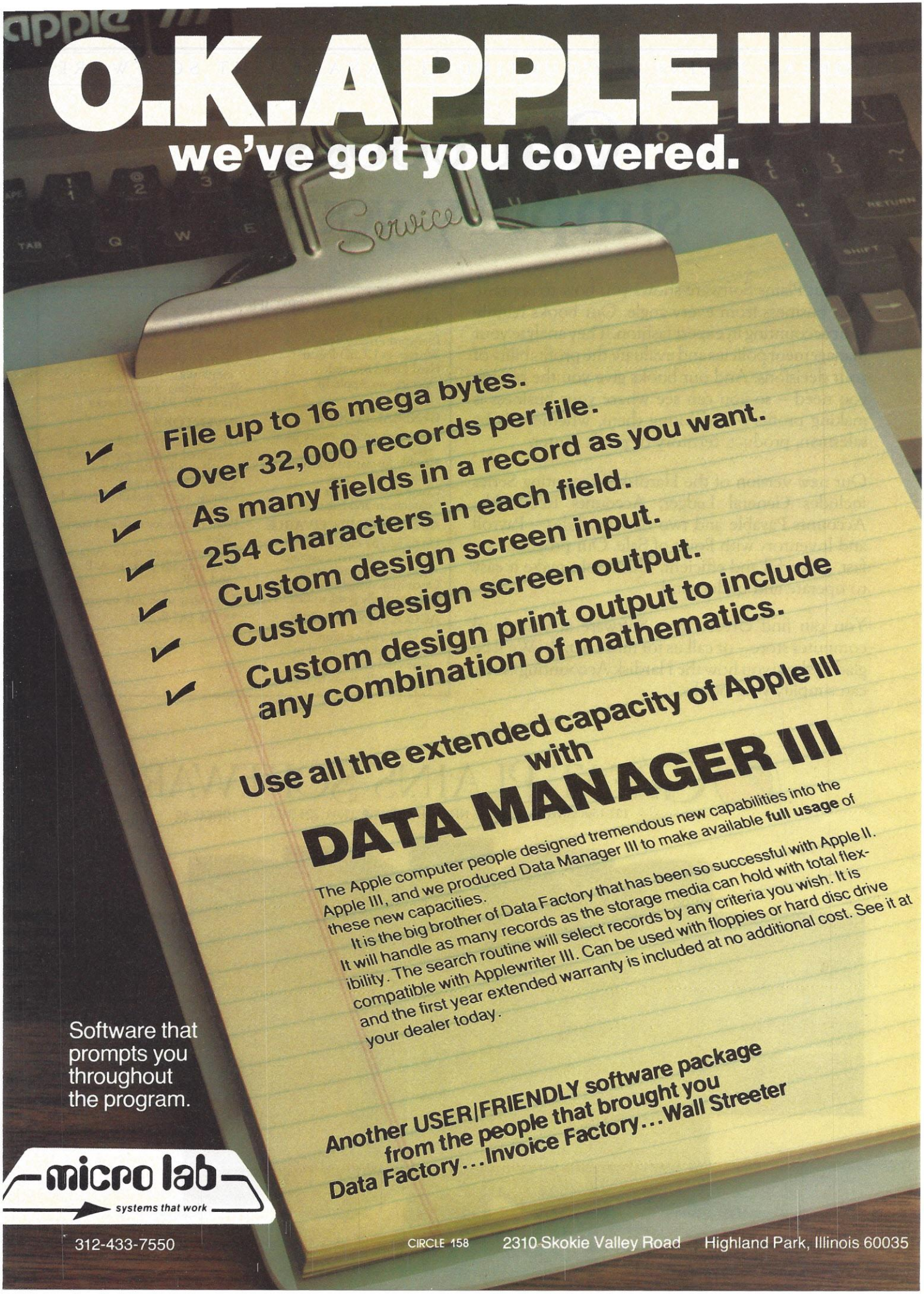
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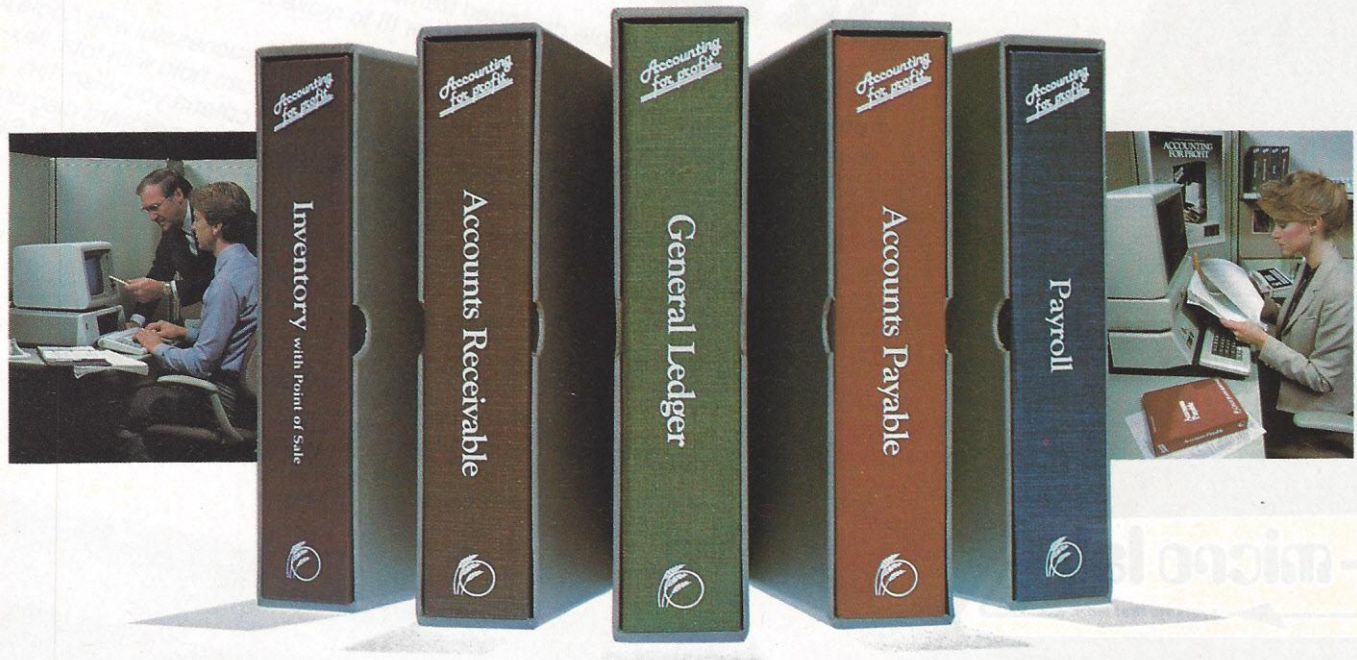

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CIRCLE 86

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CIRCLE 87

Each month Personal Computing *scans the hardware market to keep you up to date on everything that's new. Those products we consider to be most useful and exciting in this month's crop are described in this section and commended for your closer examination. Others are listed in the index.*

Apple's New Computers: A Major Breakthrough

APPLE'S NEW COMPUTER MOVES USERS INTO THE AGE OF EASY COMPUTING

LISA, the long-awaited, new Apple personal office computer, has finally arrived. As promised, it represents a considerable step forward in ease of use.

That giant step has been made by drastic changes in both hardware and software. The greatest overall difference is the use of what Apple dubs GMT—graphics/mouse technology—as opposed to conventional keyboard/text technology. The only other computer system currently on the market with similar technology is the Xerox 8010 (also known as the Star), an executive workstation intended for larger network installations.

Visually, LISA has the overall friendly look associated with previous Apple products. The primary physical difference is a "mouse"—an electromechanical control device, about the size of two cigarette packs, which the user moves around the top of a desk. Moving the mouse in a given direction moves the on-screen cursor in the same direction. When the cursor is at the desired position on screen, the user signals by pushing a button on the mouse. The mouse, while it's a simple addition, allows some fundamental changes in the user interface. All LISA software makes use of the mouse. The user can choose functions on the screen—say, word processing or spreadsheeting—simply by positioning the cursor with the mouse and pushing a button. Or he can enter a whole series of commands, even changing screen contrast or type style, without ever touching the keyboard.

All of the applications available from Apple for LISA run under a single organizing program called the Desktop Manager, which uses a bar across the top of the screen to list which applications are active. With the mouse, the user can choose a specific application that causes a pull-down menu to descend, and then select functions within the application's menu. On the right side of the screen appears a column of "icons"—small graphic presentations ranging from a tiny file cabinet to a wastebasket—that are used in various ways. When one requests a given file, the "page" appears from the file cabinet and grows to fill the screen. When a disk is inserted into the integral drive, a tiny disk appears on screen.

A final aspect of the screen display reflects the designers' desire to emulate the way people really work at a desk: specifically, at more than one project at a time. For example, in the middle of doing a word-processing function, the user can call up a page of a spreadsheet with the aid of the mouse. Then he can use the word processor to edit, format a table, and even enhance the project with spacing or different type fonts.

LISA hardware is built around the 16-bit 68000 processor, with 512k of memory as standard (expansion up to 2Mb is promised for the near future). In addition, two disk drives are integral, providing a total 1.72Mb of storage capacity. The high-resolution, bit-mapped screen (364 lines by 740 dots) has a black-on-white display (further enhancing the sense of "paper" on a "desk"), which provides extremely high-quality graphics, as well as 11 different typefaces, each available in 16 different fonts. The detachable keyboard, which fits beneath the cantilevered console for storage, has a standard typewriter layout, along with a numeric keypad. All keys can be programmed to act as function keys.

The 12-inch monitor screen uses a high-efficiency phosphor, plus a rapid refresh rate to reduce flicker and eye fatigue. The screen automatically dims and blanks if left unattended for long periods of time. The entire unit is constructed in modules, most of which can be removed by the user. Apple plans an extensive service system based on replacement modules—either through express delivery or carry-in availability. Standard interfaces include two serial ports, one parallel port, and three slots for expansion boards. Finally, the unit has efficient convection cooling, thus eliminating the need for a fan.

At the time of introduction, six application packages will be available for LISA—all fully utilizing the graphics/mouse capability, and completely integrated for sharing data and moving material among applications. Applications include:

- LisaWrite—a sophisticated word-processing system, which displays exactly what the final document will look like, including type fonts.
- LisaCalc—a spreadsheet capable of presentations as large as 256 rows by 256 columns that can be learned in less than a half hour.
- LisaList—a data-base manager, which includes a built-in, quality-control mechanism to monitor for entry accuracy.
- Lisa Project Manager—an innovative program that helps schedule and track complex projects on the basis of three types of visual flow charts.
- LisaDraw—an unusually versatile graphics tool. It creates lines, boxes, and circles with only two moves of the

mouse, and it makes even more complex shapes with drawing aids, such as rules and guides. Tables from LisaGraph and charts from the Lisa Project Manager can be moved into LisaDraw for editing and customizing, simply by using the mouse.

• LisaGraph—a full graph-generating capability. Beginners can learn it in less than a half hour and gain proficiency within two hours.

Apple plans to offer additional application packages in the future, and its engineers are also completing a "tool kit" to allow independent third-party software writers to create "LISA-type" applications. The kit will allow for full use of the pull-down menus, mouse, and font styles.

Documentation for the LISA system will be extensive, beginning with an "Apple Guide," providing interactive, computer-based instruction in the handling of the Desktop Manager. Each application program will include a 20-page "Getting Started" text; a "Cookbook," a reference guide with brief entries; and a "Tutorial," aimed at support staff, to generate "intense competence" in a three- to four-hour time frame. Some video presentations as well as a direct telephone line to the Apple staff may also be available.

Ultimately, the LISA system will emphasize networking and data communications. The newly announced Apple-Net (which Apple will also offer to other vendors for a minimal licensing fee), will be an Ethernet-compatible baseband network system that permits up to 128 nodes (including Apple IIs and IIIs), using Twinax cable at distances up to 2000 feet. The initial cost will be less than $400 per node. At the time of introduction, LISA will offer one terminal emulator package with full VT100, VT52, and TTY compatibility. Additional emulators will be offered during 1983, ultimately allowing LISA to communicate with a range of mainframes and minicomputers in a variety of configurations.

At first shipping, peripherals offered will include a modem with auto-dial and answer capabilities, the already-introduced ProFile hard disk, and two printers—one dot matrix and one letter quality. The letter-quality printer will provide professional-quality text and graphics, including fonts up to $\frac{1}{3}$ inch. All printer options are selected from a checklist on LISA. In addition, the printing format defined for each document is stored with it for future use. Like the letter-quality printer, the dot-matrix printer offers unusually easy setup ("from carton to printing in 10 minutes") as well as the ability to specify the resolution of both graphic and text output. Both printers offer "background printing," which allows the user to work on other tasks while the system prepares a document.

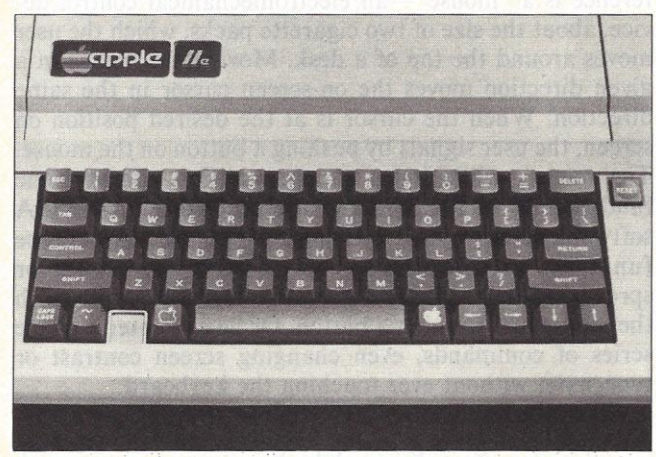
At press time, prices for LISA were not firmly set. Apple predicts a base price for the console (with 512k memory, two floppies, and the Desktop Manager software) of $7000 to $10,000. Each application will cost between $300 and $500. Some lower-cost arrangements of software bundles with hardware will probably be available. (See The Birth of LISA, page 88, for more background.)

FOR MORE INFORMATION: APPLE COMPUTER, INC., 20525 Mariani Ave., Cupertino, CA 95014; (408) 996-1010.

THE NEW APPLE IIe: ENHANCED, BUT STILL SOFTWARE-COMPATIBLE

Apple Computer has discontinued its Apple II Plus and replaced it with the new Apple IIe, which is outwardly similar to the older model. The IIe's main features include built-in 64k RAM (Random Access Memory); an upper- and lowercase character set; more function and symbol keys; typewriter-style shift keys; and provision for an inexpensive, optional 80-column display card that can be used alone or in conjunction with an additional 64k of bank-switched RAM.

The computer's motherboard (main printed circuit board) now has 31 integrated circuit chips, compared to about 100 in a comparably-equipped Apple II Plus—but



peripheral cards that need motherboard connections may not work in the IIe. Apple estimates that over 85 percent of Apple II Plus software will run in the new machine, though new program versions will be needed to fully use the IIe's enhancements.

The IIe, with its added features, will cost about the same as a II Plus. The monitor, disk drive, and printer for the Apple II Plus will continue to be sold with the new computer.

FOR MORE INFORMATION: APPLE COMPUTER, INC., 20525 Mariani Ave., Cupertino, CA 95014.

CORONA UNVEILS IBM-COMPATIBLE SYSTEMS

Corona Data Systems has introduced the first two members of a new 16-bit family of personal

(continued on page 188)

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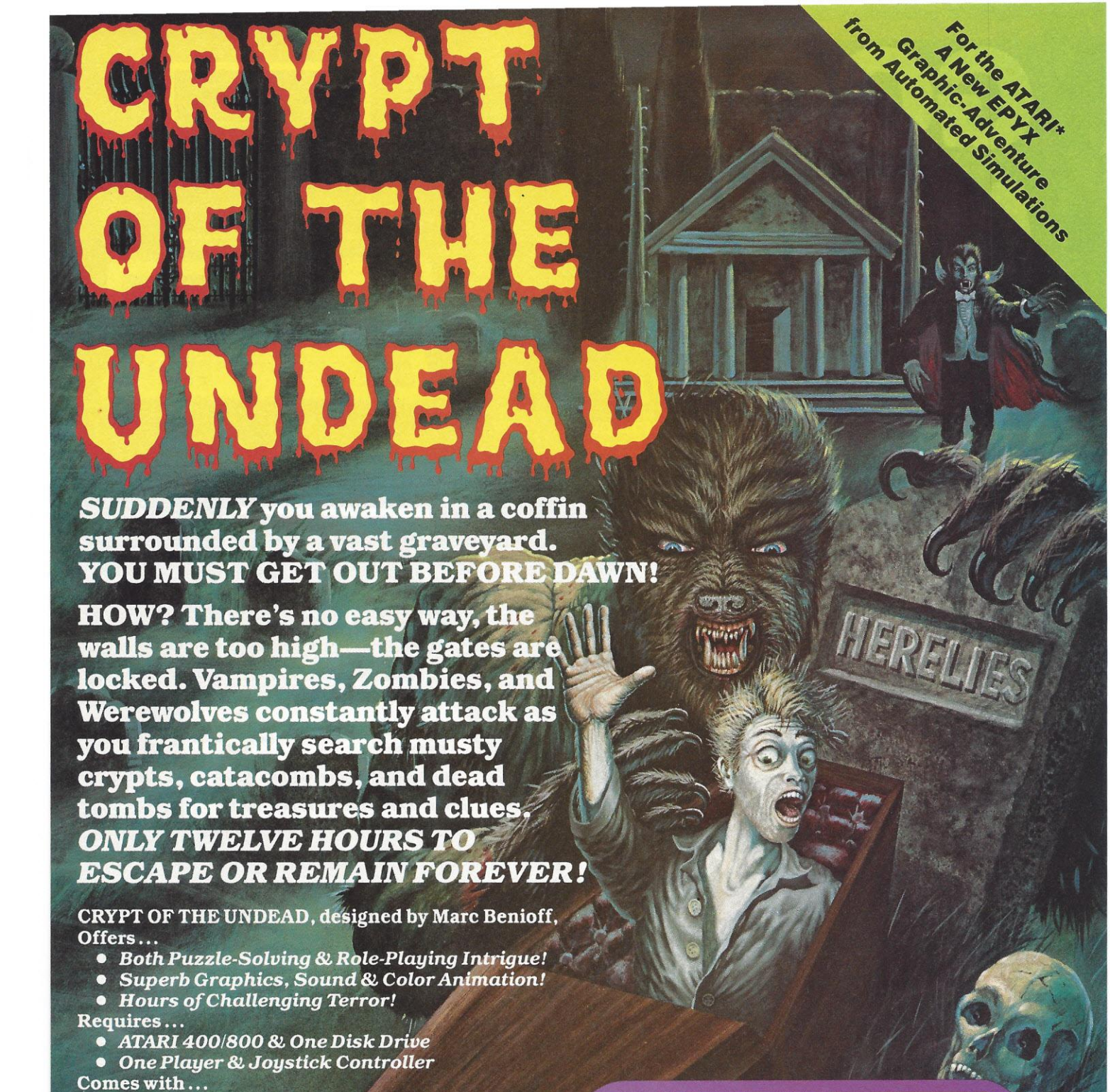

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CIRCLE 53

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CIRCLE 148

HARDWARE OF THE MONTH

(continued from page 182)
computers, compatible with the IBM Personal Computer. One, the Corona Personal Computer, is a machine that can be used on a desk top; the other, the Corona Portable, is easily transportable at 20 pounds.

Both systems include a 320k half-height disk drive that can be upgraded to a hard disk, a high resolution green-phosphor monitor, 128k of memory, serial and parallel ports, excellent graphics capabilities, MS DOS, BASIC with graphics commands, and a spreadsheet software package.

The memory limit of the Corona computers can be expanded from the base of 128k to 512k without the use of expansion slots. This allows the Corona Personal Computer to offer four available expansion slots, and the Corona Portable Personal Computer to offer three and one-half. These slots can be used for advanced components such as a hard disk drive, high-speed communications, or color graphics.

The Corona Personal Computer features a detached keyboard, a high-resolution monitor, and it is expandable to 512k without using expansion slots.

The Corona systems use an Intel 8088 microprocessor, with an 8087 co-processor available as an option. The keyboard is fully detached, with a six-foot coil cable.

Corona provides a monitor with high-resolution, high-contrast monochrome display. In conjunction with the monitor, the company supplies monochrome high-resolution graphics as a built-in feature. Graphics are displayed directly on the monitor and can be mixed with standard text on the screen.

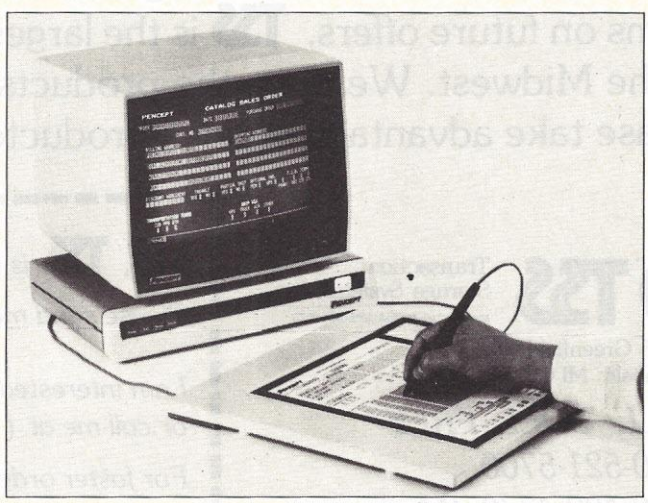
The systems maintain software compatibility with the IBM Personal Computer, and IBM's color graphics board can be run in a Corona expansion slot. This allows the use of graphics software written for the IBM Personal Computer.

Fully configured base prices are: $2595 for the Corona Personal Computer, and $2395 for the Corona Portable.
FOR MORE INFORMATION: CORONA DATA SYSTEMS, 31324 Via Colinas, Westlake Village, CA 91361; (213) 706-1505.

GIVE YOUR COMPUTER A MESSAGE

Personal Penpad can access a personal computer in a new, more natural way—by hand printing, says the unit's manufacturer, Pencept. Personal Penpad consists of a writing tablet, Pencept-developed control unit, and an electronic pen. It can recognize the full complement of alphabetic and numeric characters, as well as 15 special characters, such as dollar and equals signs, asterisks, and percentage signs.

According to Pencept president Leo Shpiz, the technology embodied in the product represents a new milestone in the history of the way people use computers. "Until today, the primary way of dealing with a computer was through a keyboard, which requires a good deal of training, skill, and inclination for a user to become effective," he says. "In contrast, everyone knows how to print. So, this technology will effectively open up computer usage to a larger group of people than ever before."



Non-typists can now easily interact with a computer using Penpad's hand printing input device.

Personal Penpad is designed to immediately recognize hand printed data and analyze the character shape to build a memory image as it is written on the tablet. Each

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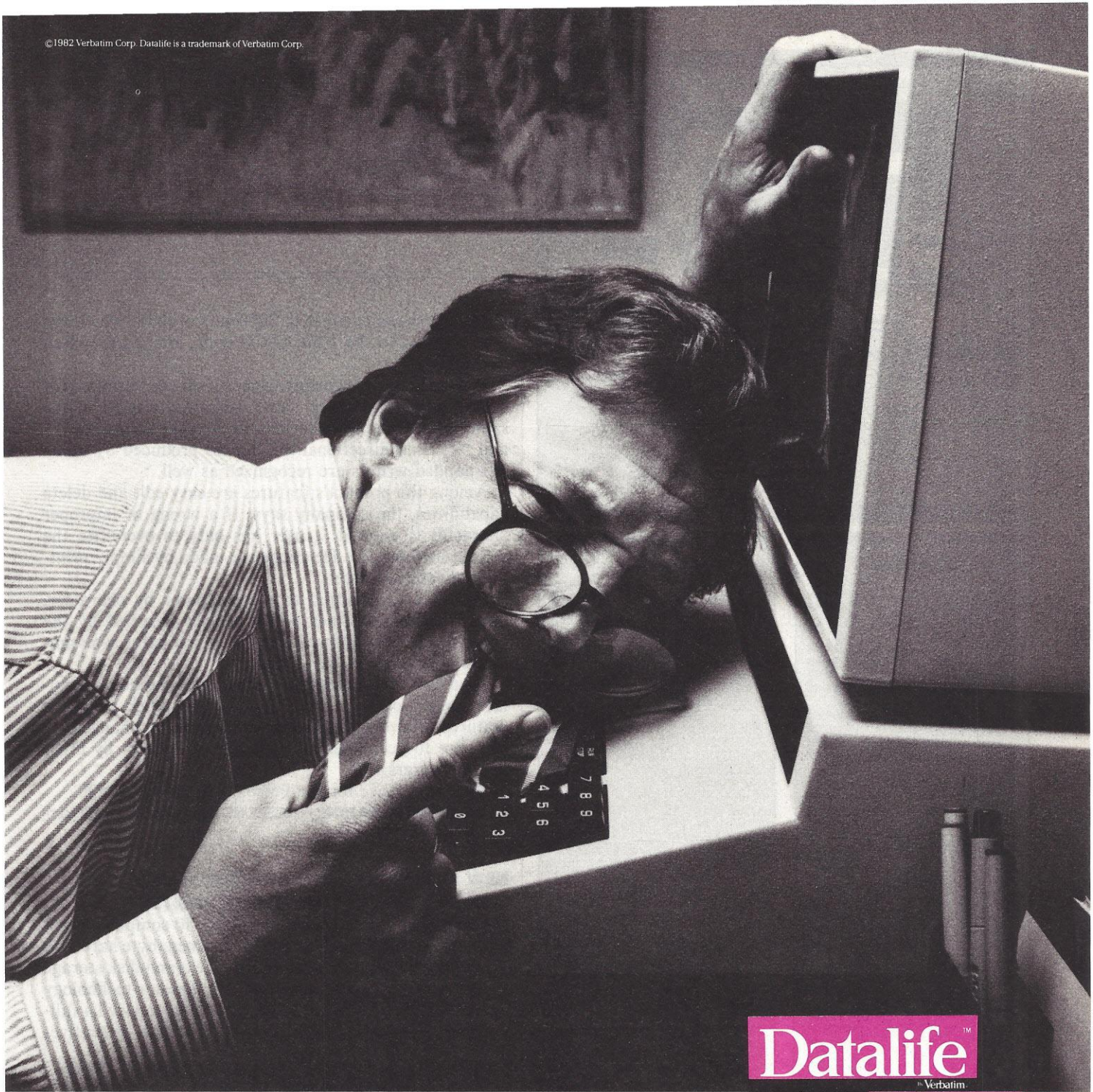

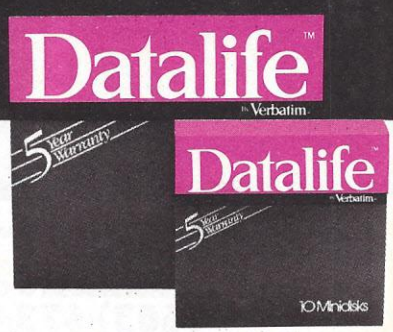

How to avoid becoming a casualty of the computer revolution.

The computer revolution is eliminating lots of work for everybody. Unfortunately, it's often work you wanted to keep.

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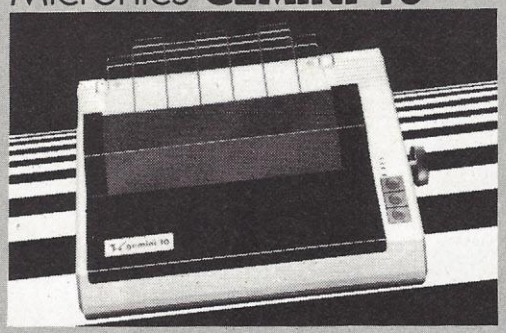
For your nearest Verbatim dealer, call toll-free 800-538-1793; in California or outside the U.S., call collect (408) 737-7771.

Star Micronics **GEMINI-10**



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- 100 characters per second, bi-directional, logic-seeking printhead action (48 lines/min.) with 2K print buffer, expanable to 4K on-board
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- 120 x 144 hi-resolution dot-addressable graphics matrix
- Subscripts, superscripts, underlining, backspace, plus 2K user-programmable character ROM, perf skip, vert/horz tabs
- Friction/tractor standard; handles 3-part forms (8.5")

PRINTERS

Anadex DP-9500A	$1459.88
Anadex DP-9501A	$1459.88
Anadex DP-9629A	$1549.88
Centronics 122-1	$829.88
Centronics 122-3	$949.88
Centronics 352	$1649.88
Centronics 353	$2324.88
C. Itoh Prowriter	$499.88
w/RS-232C	$609.88
C. Itoh Prowriter 2	$734.88
w/RS-232C	$789.88
C.Itoh F 10 Starwriter, 40 cps Parallel or RS-232C	$1499.88
C.Itoh F-10 Printmaster, 55 cps Parallel or RS-232C	$1799.88
F-10 Tractor	$289.88
Daisywriter 2000	$1089.88
Daisywriter Tractor	$149.88
Daisywriter Cable	$49.88
Diablo 620	$1269.88
Diablo 630	$1969.88
Diablo 630 KSR	$2694.88
630 Tractor	$314.88
DMP-85 Printer	$469.88
IDS Microprism	$679.88
IDS Prism 80	$1104.88
Prism 80 w/graphics	$1339.88
Prism 80 w/sheetfeed	$1459.88
Prism 80 w/4-color	$1539.88
IDS Prism 132	$1269.88
Prism 132 w/graphics	$1339.88
Prism 132 w/sheetfeed	$1459.88
Prism 132 w/4-color	$1699.88

PRINTERS

Microline 80	$349.88
Microline 82A	$439.88
80/82A Tractor	$59.88
82A Roll Paper Holder	$49.88
Microline 83A	$694.88
82A/83A Okigraph ROM	$44.88
Microline 84 w/graphics & tractor Parallel, 200 cps	$1044.88
RS-232C, 200 cps	$1164.88
NEC PC-8023A	$509.88
NEC 3510	$1929.88
NEC 3530	$1809.88
NEC 3550	$2199.88
3500 Tractor	$239.88
Qume Sprint 9/45	$2109.88
Smith Corona TP-1 10 or 12 cpi, parallel or RS-232C	$599.88

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HARDWARE OF THE MONTH

character shape is equal to 2000 bits of data, which are then reduced to the 7-bit ASCII code, and displayed on the screen.

Penpad is flexible enough to accept several variations of every character, even if those variations appear in the same word. Peculiar variations, such as the European "7" and "Z," and directional differences produced by many left-handed writers are recognized as well.

Among the product's features are easy edit and delete capabilities, the company says. If a wrong or improper character is entered, a user has only to overwrite the correct information. Deletions are made by simply printing a delete character.

Data are transmitted to the computer by character, line, or block as either predefined or specified by the operator. Sending information to the computer is as simple as checking the "send" box.

A portion of the control area is factory defined to emulate several of the IBM Personal Computer keyboard features. However, this area can easily be changed by software to accommodate personal computers by other manufacturers.

The retail price for the Personal Penpad is $3500.

FOR MORE INFORMATION: PENCEPT INC., 39 Green St., Waltham, MA 02154; (617) 893-6390.

NEW FROM RADIO SHACK—5MB HARD DISK DRIVES AND DAISYWHEEL PRINTER

Radio Shack has expanded its TRS-80 computer product line with the addition of a five-megabyte hard disk drive, which gives users the ability to expand disk storage by up to 20Mb, using high-speed, Winchester-technology hard disk drives. The company has also introduced a full-featured daisywheel printer that produces executive-

Radio Shack's DWP-410 letter-quality printer features selectable type-size and prints at over 300 words per minute.

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5.25″ Removable GENIE Winchester Cartridge Drive

IBM • APPLE II PLUS • RADIO SHACK • S-100

The Genie Cartridge Drive is a revolutionary new 10 Megabyte Hard Disk Drive that includes a 5 Megabyte removable Winchester catridge. The cartridge Drive system simply plugs into your computer, and includes all necessary software and hardware. Genie Drives are compatible with most popular software, and each cartridge replaces over 30 double-density floppy disks.

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Apple is a registered trademark of Apple Computer, Inc.
Radio Shack is a registered trademark of Tandy Corporation.
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GENIE COMPUTER CORPORATION

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CIRCLE 92

HARDWARE OF THE MONTH

quality correspondence and reports at over 300 words per minute.

Compatible with most Model III and Model I software, the new hard disk drives offer large capacity, high-speed operation and convenience. This is of great benefit in inventory management, accounting, mailing-list maintenance, electronic file keeping, and other user applications requiring a large data base, the company says.

Each disk system can store over 1000 different files, or a single file as large as 5Mb can be created. For easy file reference, the listing is displayed in alphabetical order.

A primary 5Mb hard disk drive, including an enhanced operating-system language, sells for $2495. As many as three secondary 5Mb drives can be added to a single TRS-80 Model I- or Model III-based system; each secondary hard disk drive is available for $1995. TRS-80 Model I owners will require a Model I adapter kit, available for $39.95, which includes a hard-disk system adapter, cable, and diskettes.

The second product, Radio Shack's second full-featured daisywheel printer, the DWP-410, features selectable pitch—either 10 or 12 characters per inch—or proportional spacing. Interchangeable 124-character print wheels provide easy type-face selection. And an "External Program Mode" allows the use of print wheels with different pitch or special characters.

The DWP-410 also features forward and reverse full- and half-line paper feed, underline, and programmable backspace, plus 1/120-inch minimum space and 1/48-inch line feed. Automatic paper set makes paper insertion easy and precise. A sheet of paper is placed at the rear of the 15-inch platten; with the pull of the autoset lever, the paper automatically rolls up to the first line position.

The DWP-410 Daisy Wheel Printer is U.L. listed, includes a standard parallel interface, and comes complete with print wheel and carbon ribbon cartridge. It sells for $1495.

FOR MORE INFORMATION: RADIO SHACK, 1800 One Tandy Center, Fort Worth, TX 76102 or visit your local Radio Shack store or Computer Center.

It's not Magic, it's NEC.

NEC distributors pull miracles out of a thimble.

NEC Spinwriters.™ Their supernatural reliability and versatility have made them the world's most popular letter-quality printers. Here are some of the miracles they can perform for you.

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Spinwriter is a trademark of Nippon Electric Co., Ltd.

NEC

NEC Information Systems, Inc.

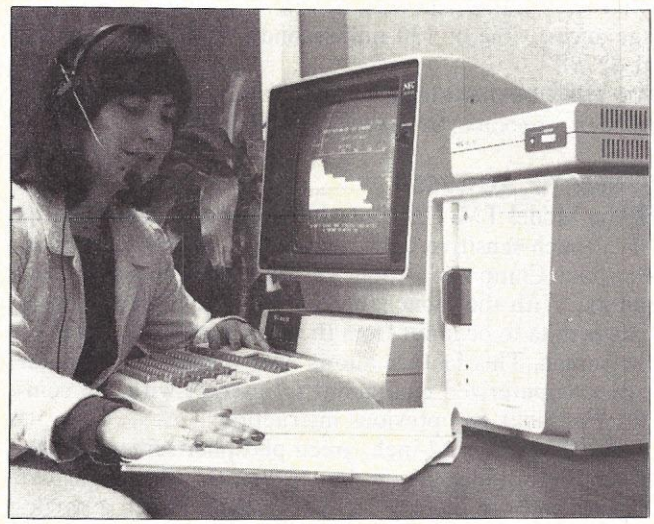
NEW FROM NEC INFORMATION SYSTEMS: VOICE-RECOGNITION UNIT AND HARD DISK DRIVE

NEC Information Systems has two new peripherals for its personal computer lines: a voice-input terminal for its Astra series, and a 12Mb Winchester-type hard disk drive for its Advanced Personal Computer.

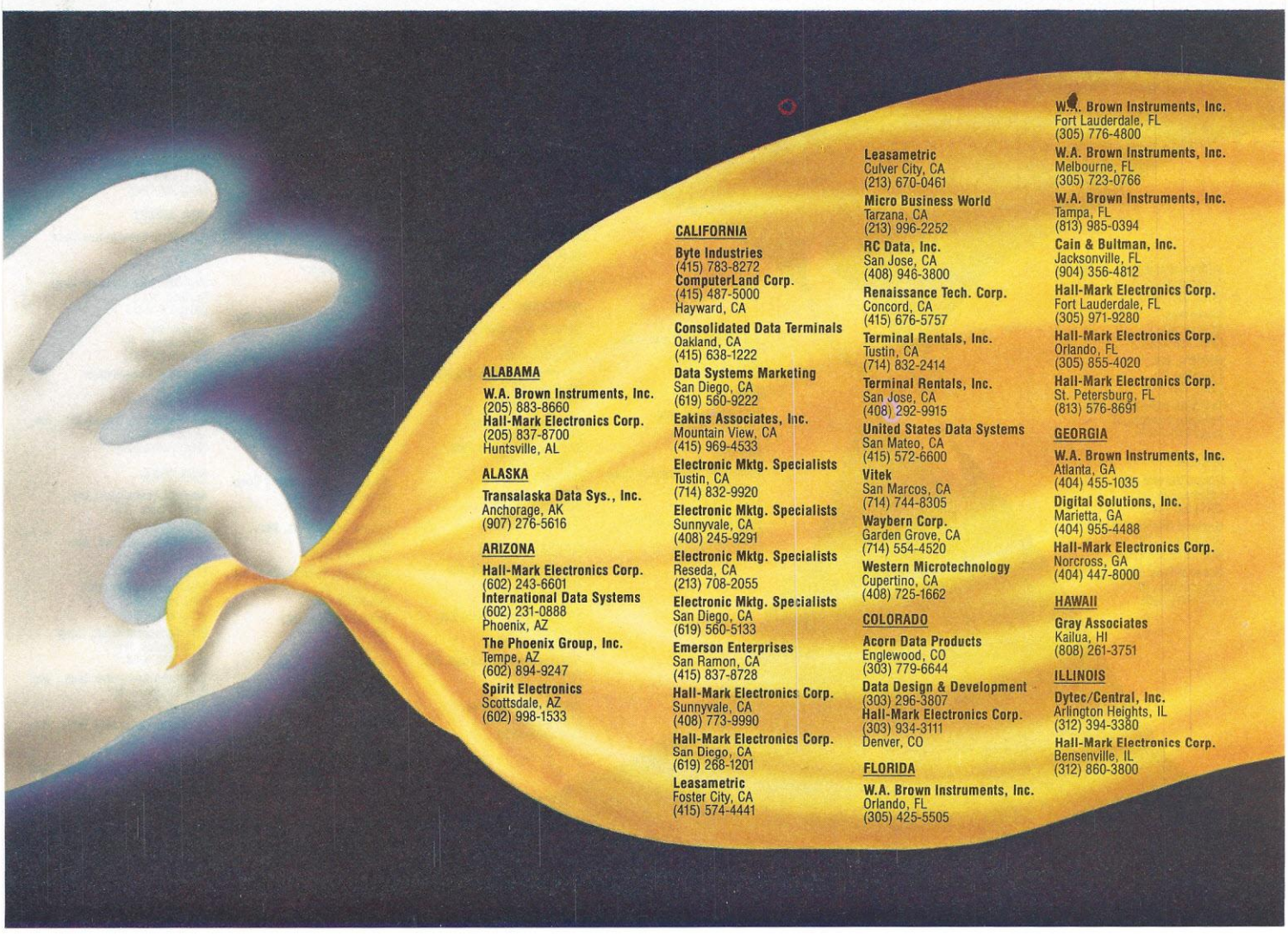
With a potential vocabulary of 120 words, the new voice-input unit, the NEC SR-100 VRU, is useful for data input, control of industrial processes, and information retrieval. It is easily programmed and totally speaker dependent, which means that its user can "teach" the device the pronounciation of the words in its vocabulary. It recognizes the correct word better than 99 percent of the time and responds within 300 milliseconds, according to NEC Information Systems.

The unit, priced at $2000, is available on all models of the Astra Series, ranging in size from the smaller Astra 200 to the 16-terminal Astra 270.

The NEC high-performance 5¼-inch hard disk drive offers a formatted storage capacity of 9.27Mb, track to



The NEC SR-100 VRU allows a user to "teach" it how to pronounce a vocabulary of up to 120 words.



HARDWARE OF THE MONTH

track head movement time of 120 milliseconds, and average access time of 130 milliseconds. The drive is priced at $2798.

FOR MORE INFORMATION: NEC INFORMATION SYSTEMS, INC., 5 Militia Dr., Lexington, MA 02173; (617) 862-3120.

FINGERTIP ACCESS

The Model TM-120, from Interaction Systems, Inc., is a touch-sensitive CRT monitor for use with the IBM Personal Computer, Apple II, and other personal computers. With the "touchable" monitor, a fingertip touch causes data to be input from the information displayed on the screen. This feature allows even a person unfamiliar with computerized equipment to interact with the computer without any previous instruction.

The TM-120's 12-inch, green phosphor screen accepts a composite video input. It provides 32 touch-sensitive regions and can display 25 lines of data. When a particular area is touched, an ASCII sequence is sent to the computer through an RS-232 serial line.

An electronic method under microprocessor control detects the change in capacitance that occurs when a person touches the screen.

The Model TM-120 is priced at $1295.

FOR MORE INFORMATION: INTERACTION SYSTEMS, INC., 24 Munroe St., Newtonville, MA 02160; (617) 964-5300.

MASS-STORAGE DEVICE FOR ATARI USERS

The Percom Data AT-88 is a single-density drive that gives Atari 400 and 800 users an inexpensive method of data storage. It also expands the overall capability of the Atari computers, offering 88k (formatted).

The AT-88 has its own integral power supply, and is shipped with the OSA/Plus operating system at no additional cost. The drive, which has plug-in compatibility to the Atari computers, can also use the Atari operating system software without any modification.

The suggested retail price is $488.

FOR MORE INFORMATION: PERCOM DATA COMPANY, 11220 Pagemill Rd., Dallas, TX 75243; (214) 340-7081.

Information Systems, Inc.
Arlington Heights, IL
(312) 228-5480

Kaltronics
Northbrook, IL
(312) 291-1220

Nabih's, Inc.
Evanston, IL
(312) 869-6140

Tek-Aids Industries, Inc.
Arlington Heights, IL
(312) 870-7400

INDIANA

Dytec/Central, Inc.
Indianapolis, IN
(317) 247-1316

General Microcomputer
South Bend, IN
(219) 277-4972

Graham Elec. Supply, Inc.
Indianapolis, IN
(317) 634-8202

Star-Tronic Distributor Co.
Carmel, IN
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Inland Associates, Inc.
Olathe, KS
(913) 764-7977

LOUISIANA

W.A. Brown Instruments, Inc.
Mandeville, LA
(504) 626-9701

MARYLAND

Bartlett Associates, Inc.
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Hall-Mark Electronics Corp.
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Micro Distributors, Inc.
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Rockville, MD

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Baltimore, MD
(301) 644-2900

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The Computer Store, Inc.
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Continental Resources, Inc.
Bedford, MA
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CPU Computer Corp.
Charlestown, MA
(617) 242-3350

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Simsim, Inc.
Natick, MA
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Minneapolis, MN
(612) 623-3850

Tele-Terminals, Inc.
Brooklyn Park, MN
(612) 536-6000

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Inland Associates, Inc.
St. Louis, MO
(314) 391-6901

NEW JERSEY

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Hall-Mark Electronics Corp.
Fairfield, NJ
(201) 575-4415

Logon, Inc.
Hackensack, NJ
(201) 646-9222

TransNet Corporation
Union, NJ
(201) 688-7800

WP Periph. & Supply Co., Inc.
Matawan, NJ
(201) 946-4995

NEW YORK

Bartlett Associates, Inc.
White Plains, NY
(914) 949-6476

Bartlett Associates, Inc.
Holcomb, NY
(716) 657-6309

The Computer Factory
New York, NY
(212) 687-5000

Erin Computer Distr. Corp.
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Ossmann Computer Tech., Inc.
East Syracuse, NY
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Ossmann Computer Tech., Inc.
Rochester, NY
(716) 473-5720

Ossmann Computer Tech., Inc.
Vestal, NY
(607) 785-9947

HARDWARE INDEX

A COMPREHENSIVE LISTING OF NEW PRODUCTS

SYSTEMS

PRODUCT/FEATURES/PRICE	COMPANY/AVAILABILITY
DOT portable personal computer with full IBM Personal Computer compatibility, featuring an Intel 8088, 16-bit microprocessor with MS DOS operating system $2995	Computer Devices Burlington, MA 01803 mail order CIRCLE 303
LISA new personal office computer which uses graphics/mouse technology, allowing ease in choosing functions; hardware is built around the 16-bit 6800 processor with 512k RAM standard	Apple Computer Cupertino, CA 95014 see story on page 181 retail CIRCLE 365
MTI Personal Executive Computer a single unit which uses 16-bit and 8-bit operating systems and features 64k of internal memory $2000	Microcomputer Technology Inc. Santa Ana, CA 92704 retail or mail order CIRCLE 306
Olympia Portable Computer fully programmable, supports a total memory capacity of 116k; 64k of ROM and 52k of RAM, designed for ease of use $380	Olympia USA Somerville, NJ 08876 retail CIRCLE 307
TS800 can serve up to 15 additional users as a satellite station once the user is employing MmmOST $1495	TeleVideo Systems Sunnyvale, CA 94086 mail order CIRCLE 316
TS803 serves as a stand-alone and can	TeleVideo Systems Sunnyvale, CA 94086

(continued on page 198)

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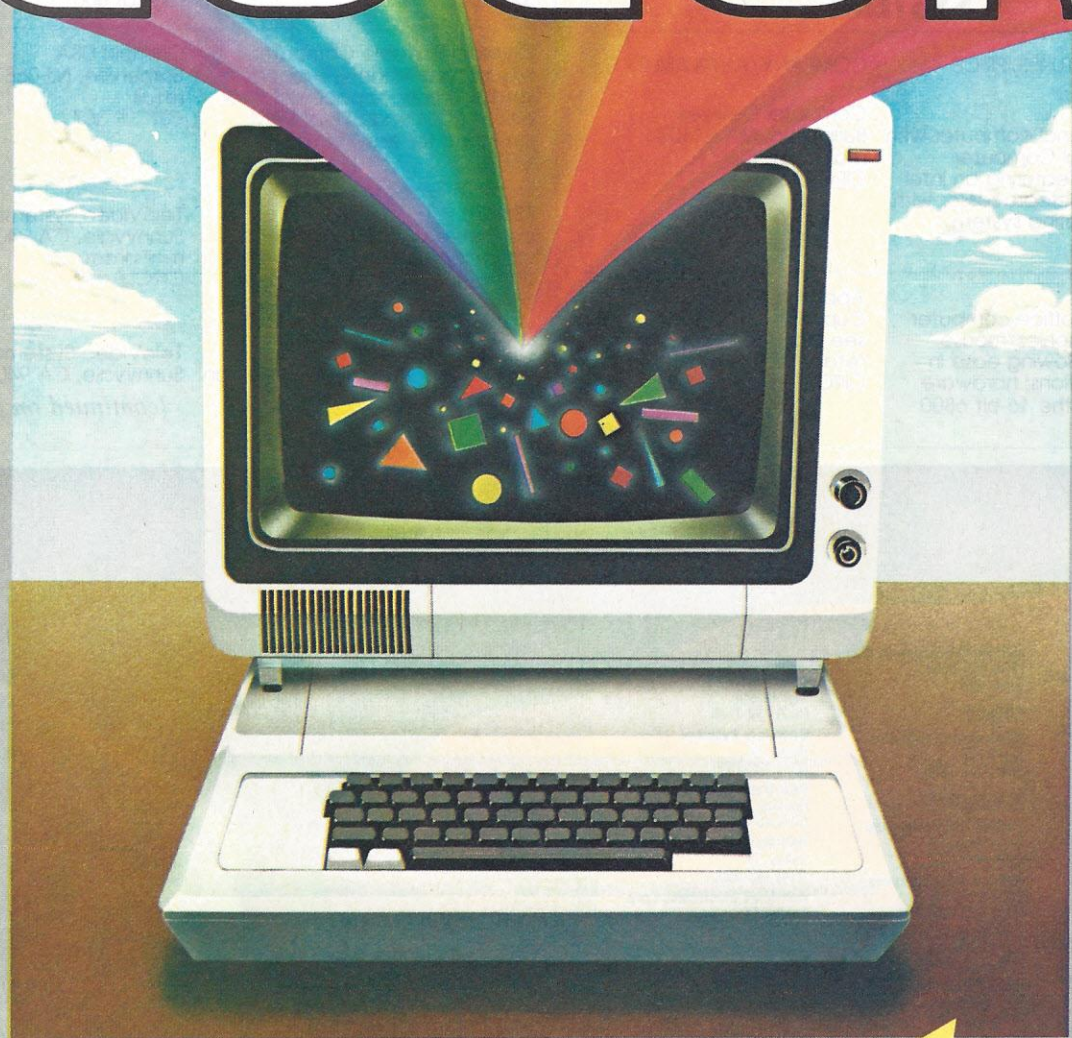

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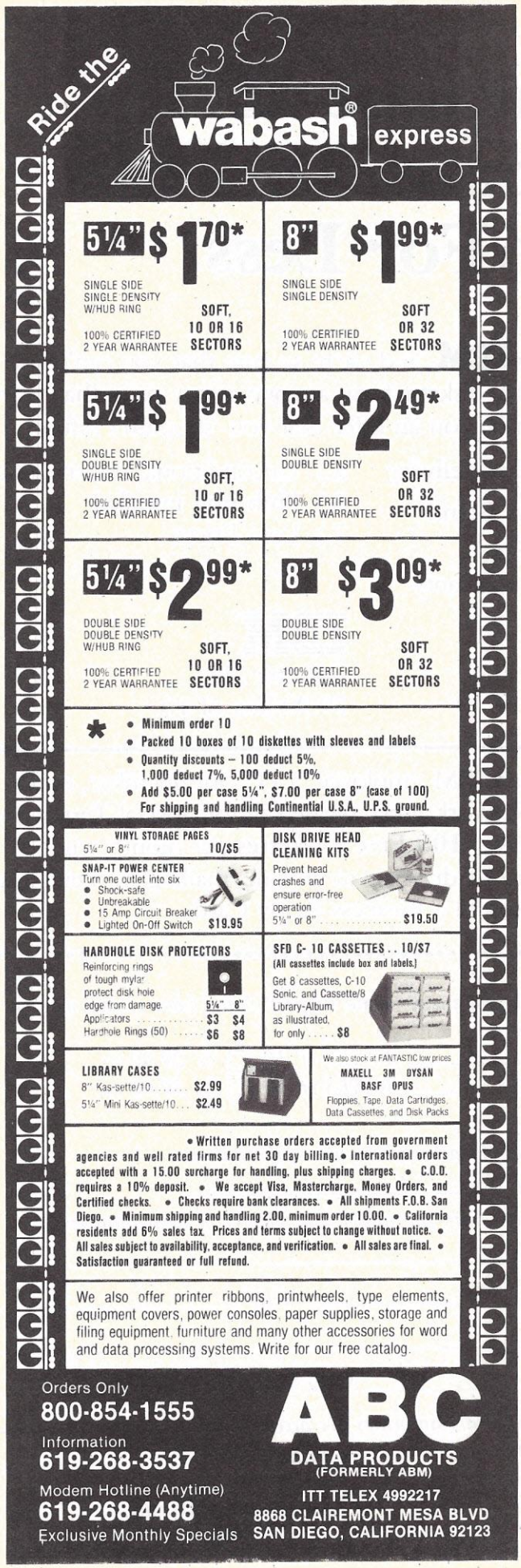
PC1

CIRCLE 98



CIRCLE 99

HARDWARE INDEX

(continued from page 193)

connect into a service processor to utilize TeleVideo's proprietary network manager
$2495
mail order
CIRCLE 317

MASS STORAGE

APC Hard Disk Subsystem
high performance 5¼-inch drive offering a formatted storage capacity of 9.27 megabytes for the NEC Advanced Computer
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NEC Information Systems
Lexington, MA 02173
retail
CIRCLE 366

AT–88
single density disk drive offering 88 k (formatted) with plug-in compatibility for Atari 400 and 800
$488
Percom Data Company Inc.
Dallas, TX 75243
mail order
CIRCLE 316

Disctron D-1600
an 8-inch Winchester fixed disk drive with capacity of 160 megabytes (unformatted)
$2450
Disctron, Inc.
Milpitas, CA 95035
mail order
CIRCLE 319

Hard Disk Drive (26-1130)
offers the ability to expand disk storage by up to 20 megabytes or TRS-80 Model I and III
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see story on page 190
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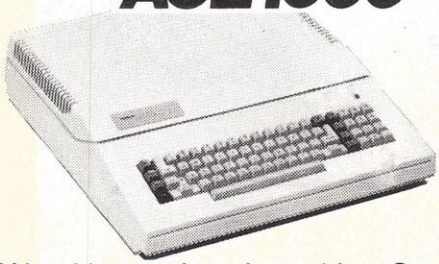

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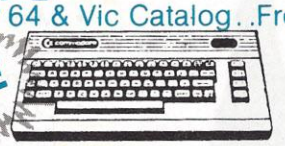

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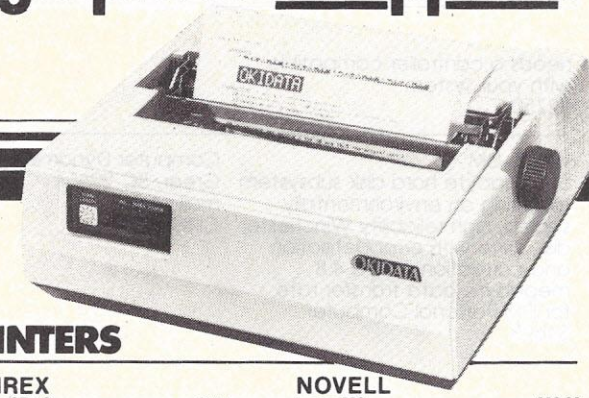

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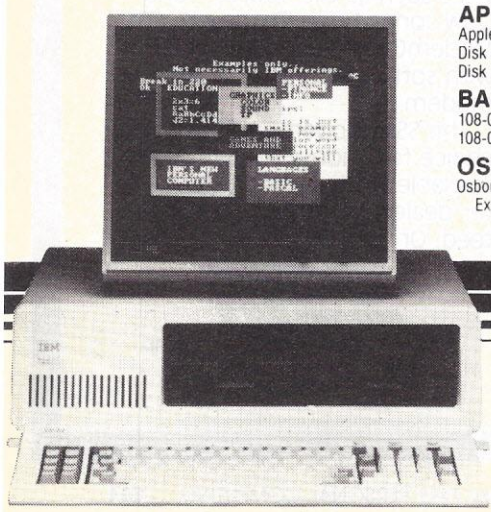

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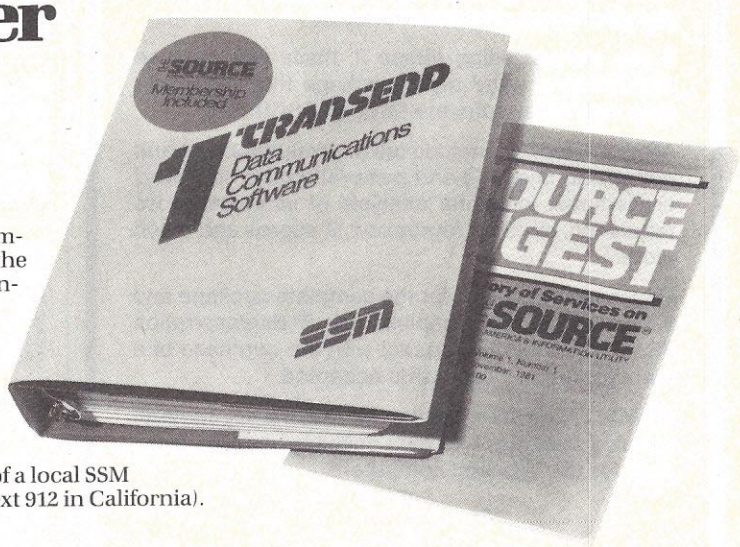

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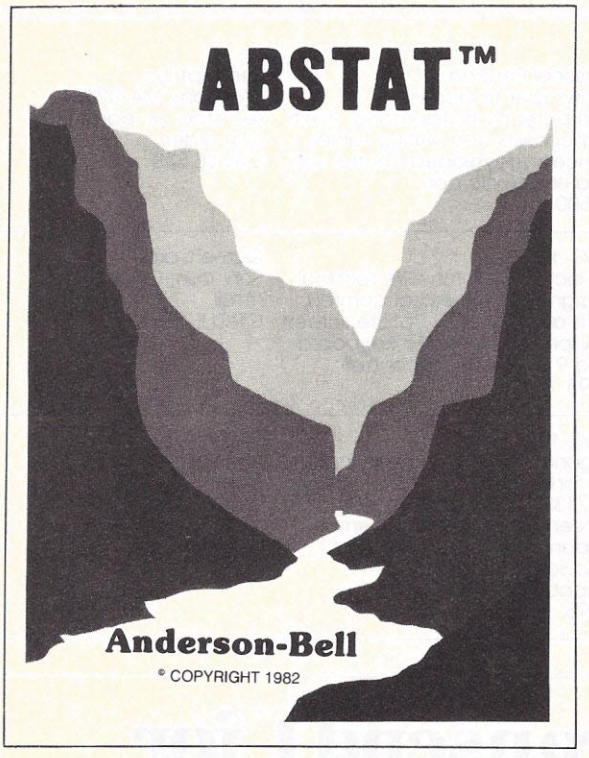

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RX/1200
allows the error-free transfer of software over ordinary telephone lines; Bell System 212A compatible
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Microcom, Inc.
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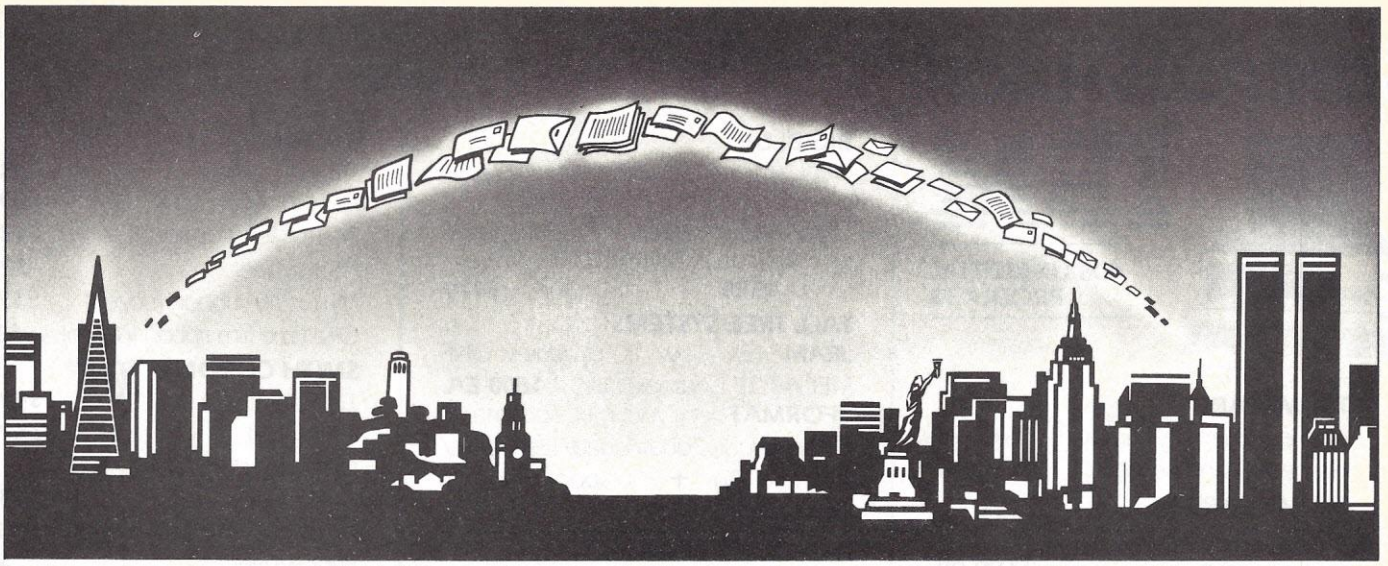
SSM Apple ModemCard
a 110/300 baud full duplex modem featuring half and full duplex, auto answer/auto dial, Touch Tone and pulse dialing, and audio monitoring to provide increased flexibility for use with many systems, including PBX
for Apple II
$299
SSM Microcomputer Products
San Jose, CA 95131
retail
CIRCLE 351

Tandy T-76 Communications Controller
permits TRS-80 products to communicate with IBM hosts
Radio Shack
Ft Worth, TX 76102
retail
available only through Radio

(continued on page 208)



It's 2 AM. Your Apple II is sending budgets to New York; purchase orders to Boston; a contract to St. Louis; and correspondence to every field rep in the country. Automatically. Transend, from SSM.

Transend software opens the world of electronic communications to your Apple. From sending mail over the phone to connecting with information banks—the doors opened by Transend are practically unlimited.

Take electronic mail. SSM's Transend 3 lets your Apple correspond *automatically* over phone lines with *up to 100* Apples—at any hour you choose. Your Apple dials each phone number, transfers data electronically, verifies that the data was transmitted intact, and provides a complete call status report. Transend 3's password feature means only authorized users see sensitive information.

8:37 AM. Your Apple receives mid-morning sales reports from the Apple in your New York office.

Transend 2 lets your Apple correspond over the phone with other Apples. Error detection features guarantee the accurate transmission of your valuable data.

1:52 PM. Your Apple displays current flight schedules and connects you to a ticket agent via THE SOURCE℠.

SSM's Transend 1 turns your Apple into an intelligent terminal connected to your corporate computer, a timeshare system, or any information service such as THE SOURCE. (In fact, all Transend software includes a valuable subscription offer for THE SOURCE.)

You'll get business news, the most recent stock reports, advance UPI world news—even flight schedules—in moments. And new possibilities arise constantly.

11:53 PM. With the SSM Apple ModemCard™, your Apple is always ready to dial the phone.

SSM's 300 baud modem card fits conveniently inside your Apple. Advanced features include Auto-dial/Auto-answer for unattended operation, and Touch-Tone™ dialing (required for networks such as Sprint® or MCI Advantage™). The SSM ModemCard makes all other modems obsolete.

2 AM. The SSM Apple TimeCard™ lets your Apple work while you sleep.

The SSM Apple TimeCard lets your Apple Transend mail automatically at any hour. It keeps accurate time for other uses as well.

Need help?

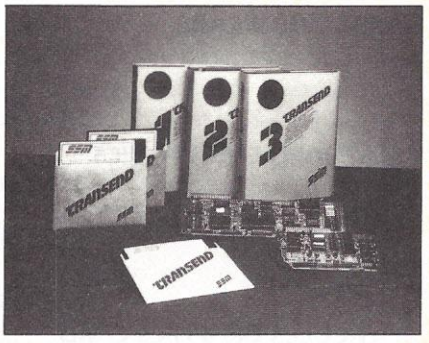
Simply Transend your question to SSM's 24-hour electronic message board. The next business day, your answer will appear on the board for easy reference.

"How do I Transend my Apple?"

Easily. Just go to your dealer for a flexible choice of SSM products. You can purchase easy-to-use, prepackaged hardware/software combinations, or separate components to fit your needs and budget. SSM guarantees your satisfaction or your money back.

SSM Microcomputer Products Inc.
2190 Paragon Drive, San Jose,
CA 95131 (408) 946-7400,
Telex: 171171 SSM SNJ

The Transend family from SSM: Transend 1 (intelligent terminal software that lets your Apple talk to virtually any computer, including information services), Transend 2 (software that lets your Apple send verified electronic mail to other Apples), Transend 3 (full-featured electronic mail software with automatic mailing capabilities), the SSM Apple TimeCard, and the SSM Apple ModemCard.



SSM

Transend it.

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Disk drive controller $79.00

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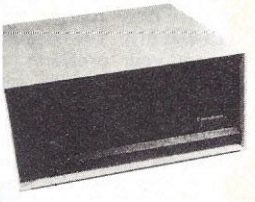
100% Comoatible disk drive for Apple II +.



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SUGGESTED RETAIL PRICE . . . $429.00
Drive with controller card $359.00

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(continued from page 204)

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Agile 5278 enables the personal computer to emulate the widely-used IBM 3278 CRT terminal, allows psuedo batch mode processing and even actual distributed processing to be accomplished by the host computer for IBM Personal Computer, TRS-80 Model II, Apple II and Apple III, HP-125, DEC PC-100, DEC ET-180 $1595	Agile Corp. San Jose, CA 95131 mail order CIRCLE 340
Apparat RAM card	Apparat, Inc.
can expand memory in increments of 64k with parity, up to 256k; software independent, addressable on 64k boundaries and has no wait states for the IBM Personal Computer $149	Denver, CO 80237 mail order CIRCLE
Codata 8-channel serial I/O board offers eight serial input/output channels, configured for use with a variety of data communications equipment for multi-bused-based systems $2250	Codata Systems Corp. Sunnyvale, CA 94086 mail order CIRCLE 342
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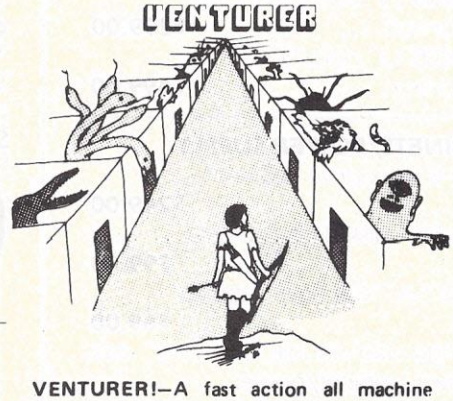
OSI TRS–COLOR 80 SINCLAIR VIC 20 & 64

BASIC THAT ZOOOMMS!!
AT LAST AN AFFORDABLE COMPILER FOR OSI AND TRS-80 COLOR MACHINES!!! The compiler allows you to write your programs in easy BASIC and then automatically generates a machine code equivalent that runs 50 to 150 times faster.
It does have some limitations. It takes at least 8K of RAM to run the compiler and it does only support a subset of BASIC—about 20 commands including FOR, NEXT, END, GOSUB, GOTO, RETURN, END, PRINT, STOP, USR(X), PEEK, POKE, *, / , + , - , X , X , = , VARIABLE NAMES A-Z, A SUBSCRIPTED VARIABLE, and INTEGER NUMBERS FROM 0 - 64K.
TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20 page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI or TRS-80 Color. **tape for Vic**

LABYRINTH – 16K EXTENDED COLOR BASIC – With amazing 3D graphics, you fight your way through a maze facing real time monsters. The graphics are real enough to cause claustrophobia. The most realistic game that I have ever seen on either system. $14.95. (8K on OSI)



QUEST – A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time.
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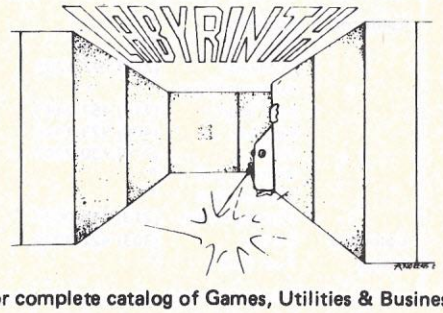

VENTURER!—A fast action all machine code Arcade game that feels like an adventure. Go berserk as you sneak past the DREADED HALL MONSTERS to gather treasure in room after room, killing the NASTIES as you go. Great color, high res graphics, sound and Joystick game for the TRS-80 Color or OSI machines. (black and white and silent on OSI.) Tape only. $19.95.

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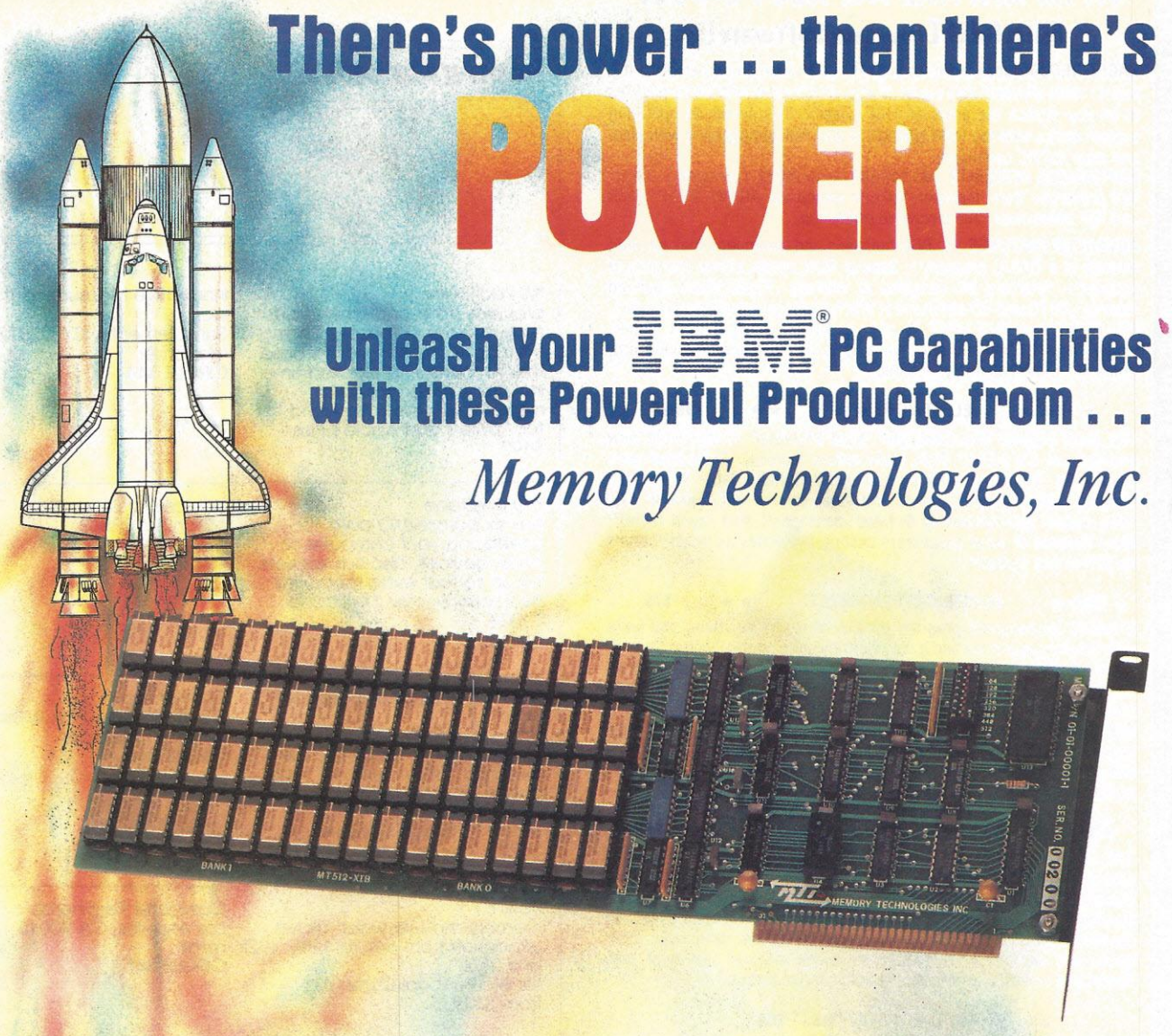

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CIRCLE 136

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CIRCLE 113

HARDWARE INDEX

IMI RealClock
provides date and time values for numerous purposes, ranging from date stamping data-base files to measuring elapsed time in running programs to a resolution of one millisecond
for Apple II and Apple II Plus
$190

Innovative Measurements Inc.
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mail order
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for Commodore VIC-20 and 64
$79.95

Cardco, Inc.
Wichita, KS 67226
retail
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(continued on page 214)

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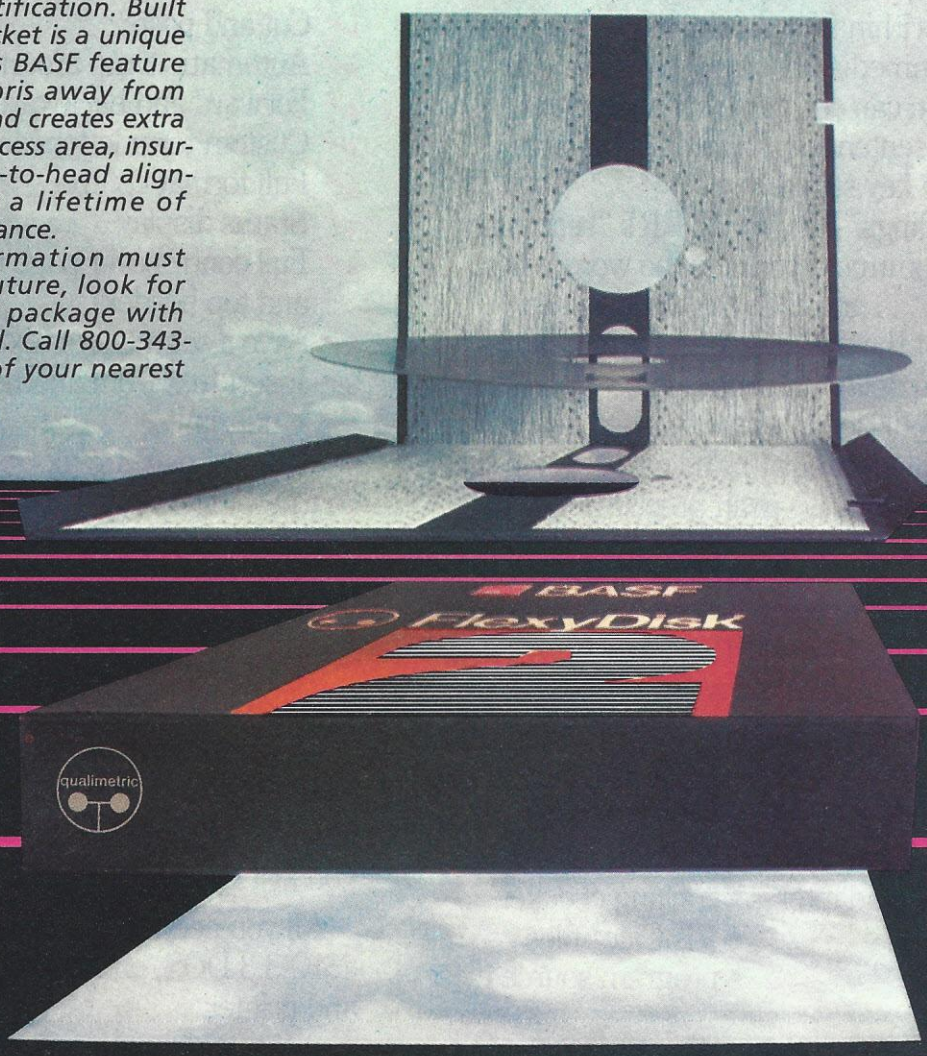

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CIRCLE 114

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CIRCLE 116

(continued from page 210)

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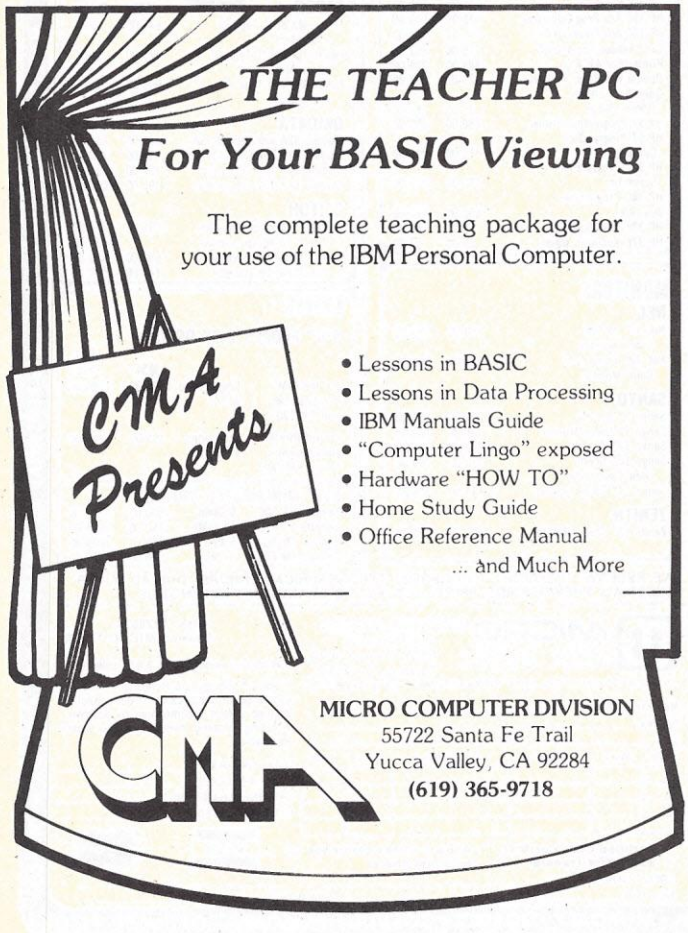

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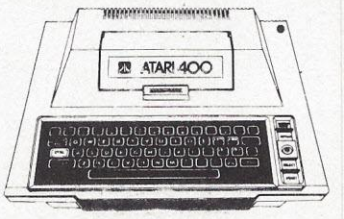

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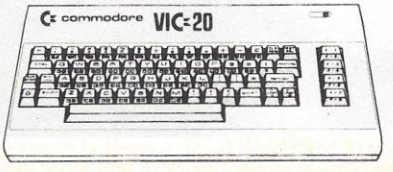

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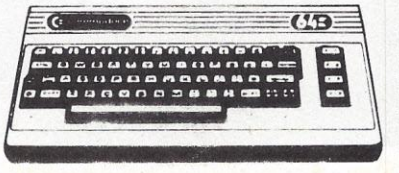

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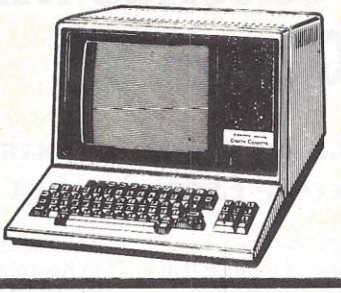

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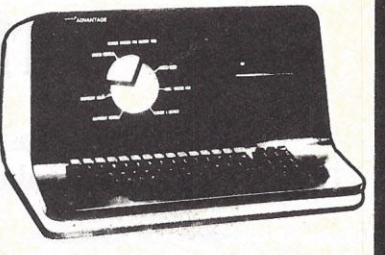

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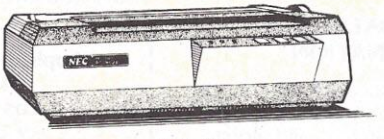

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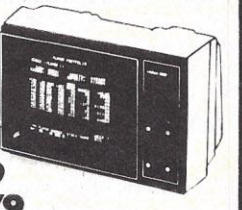

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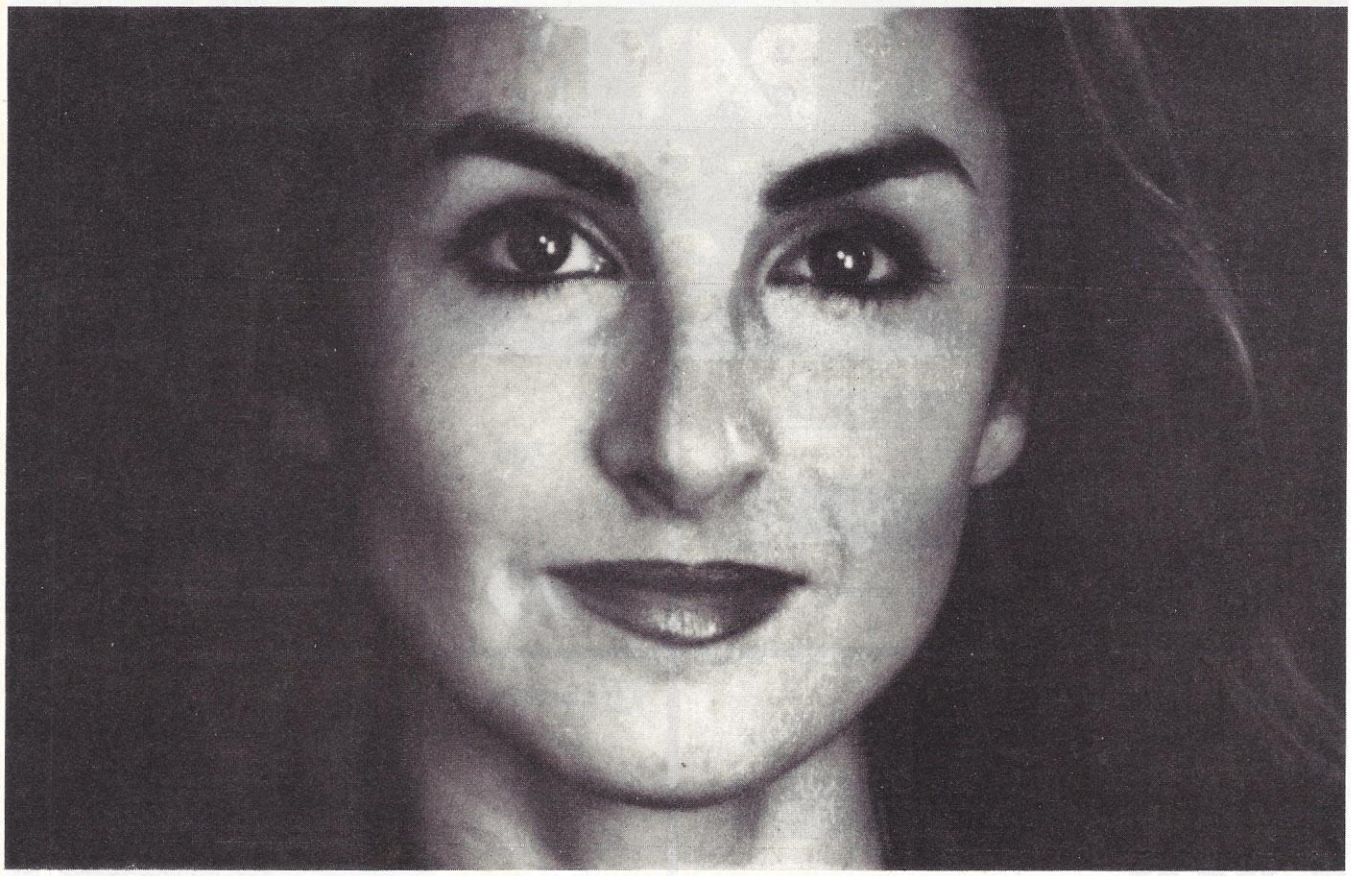

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CIRCLE 118

Each month Personal Computing *scans the software market to keep you up to date on everything that's new. Those products we consider to be most useful and exciting in this month's crop are described in this section and commended for your closer examination. Others are listed in the index.*

Solutions For Communicating And Paperless Paper Shuffling

DIALING UP A DATA BASE AT THE PRESS OF A KEY

Every experienced data-communications user knows that much time can be wasted in calling up and connecting to a data base. Hayes Microcomputer Products is doing something about that wasted time.

Hayes' Smartcom software takes the need to dial the phone away from the user, and handles the chore automatically. This doesn't mean that Smartcom is simply a program that performs auto-dial—those have been around for a while. This new program can dial any of a long list of stored numbers at the push of a single key.

For example, by normal channels, if you want to call The Source, you first have to dial a local number to link into either Telenet or Tymnet in your particular area. Receiving the prompt from either of these services, you then have to go through a rather elaborate procedure to log on to the information utility that you have selected.

Smartcom has all that log-on information in it. If you want to dial The Source, you simply boot the Smartcom program in your IBM Personal Computer (the one the program runs on now) and select The Source from the menu of utilities on the program disk. The utility you select is automatically accessed by means of a set of macro-instructions, or subprograms on the disk. The only preparation you had to go through was to link the local time-sharing network (Telenet or Tymnet) to the appropriate macro-instruction set—the Smartcom program does the rest.

Smartcom doesn't stop there. Hayes reasoned that most people who connect with the online data banks have one or two applications they want to access each time they get on-line. They might, for instance, need to get stock quotes, or they might want to hook up to UPI to get the latest news. There are macro-instruction sets for these applications, too, so the user need only push another button, and Smartcom plows through the menus of the information utility to directly connect the user with the application he wants.

Smartcom's capability provides the user with two advantages. First, it saves time, because the user has already figured out what he wants to do off line, and has instructed the program to set the procedures up for him. He doesn't have to wait for appropriate prompts from the information utility, and then carefully consider the entries he makes. This first savings leads to the second;

(continued on page 220)

A VISUAL COUNTERPART OF THE TOP OF YOUR DESK

VisiCorp, the company that pioneered the Visi series of software products, has produced a new "operating environment" called VisiOn. The company calls this product an entry into the next generation of software. VisiCorp describes the new offering as a continuation of its attempt to provide additional capabilities to users of small computers—capabilities those users didn't have before.

VisiOn provides what VisiCorp chairman Dan Fylstra calls "a consistent user interface to all kinds of applications programs." With VisiOn users are presented with a visual counterpart of the top of their desks. The software allows users to visually manipulate images of graphs and charts in the same way they would work with papers on their desks.

Suppose, for example, that you want to work on a budget presentation. On your desk you would probably have a spreadsheet pad, plus notepaper on which you could write the preliminary text of remarks you want to make in the presentation. It's possible that you'd have a quadrille ruled pad, too, so that you could sketch additional charts or graphs.

As you work on the presentation, the spreadsheet pad would be in the center of the desk, and the other accoutrements would be pushed to the side or under the pad. Then, when you reach the result you're looking for, you might jot down a figure on the notepaper, or plot a point on the graph paper.

You can do the same thing with VisiOn. The different applications you can do with VisiOn are represented on the screen in "windows," or portions of the screen that show different information. At least four windows can be running at one time—more if the computer is running a multitasking operating system like concurrent CP/M.

Windows are opened and closed by pointing the cursor at the window you want to view. The cursor is moved with a mouse (included with the software), which is a box-like control device that you roll across your desk. The mouse allows you to keep track of the cursor's present location on the screen. Buttons on the top of the mouse allow you to stop the movement of the cursor when you are at the window that you select.

The window in which you are operating can be expanded to any size, up to the maximum screen size, by using a command called FRAME. With the FRAME

(continued on page 220)

Nobody offers you a wider variety of computer printers and printer experience than Facit/Dataroyal ... all the way from low cost ($695 list) matrix printers, to sophisticated graphics and color matrix printers, to models that print variable size characters and bar codes, to "daisy wheels" and a multimode near letter-quality printer. Industry standard parallel and RS232C serial interfaces are available in all printers.

Our products are built to perform day after day in the most rugged environments. We achieve that kind of reliability by incorporating modern, trouble-free LSI circuitry, and fewer moving mechanical parts along with a high level of quality control.

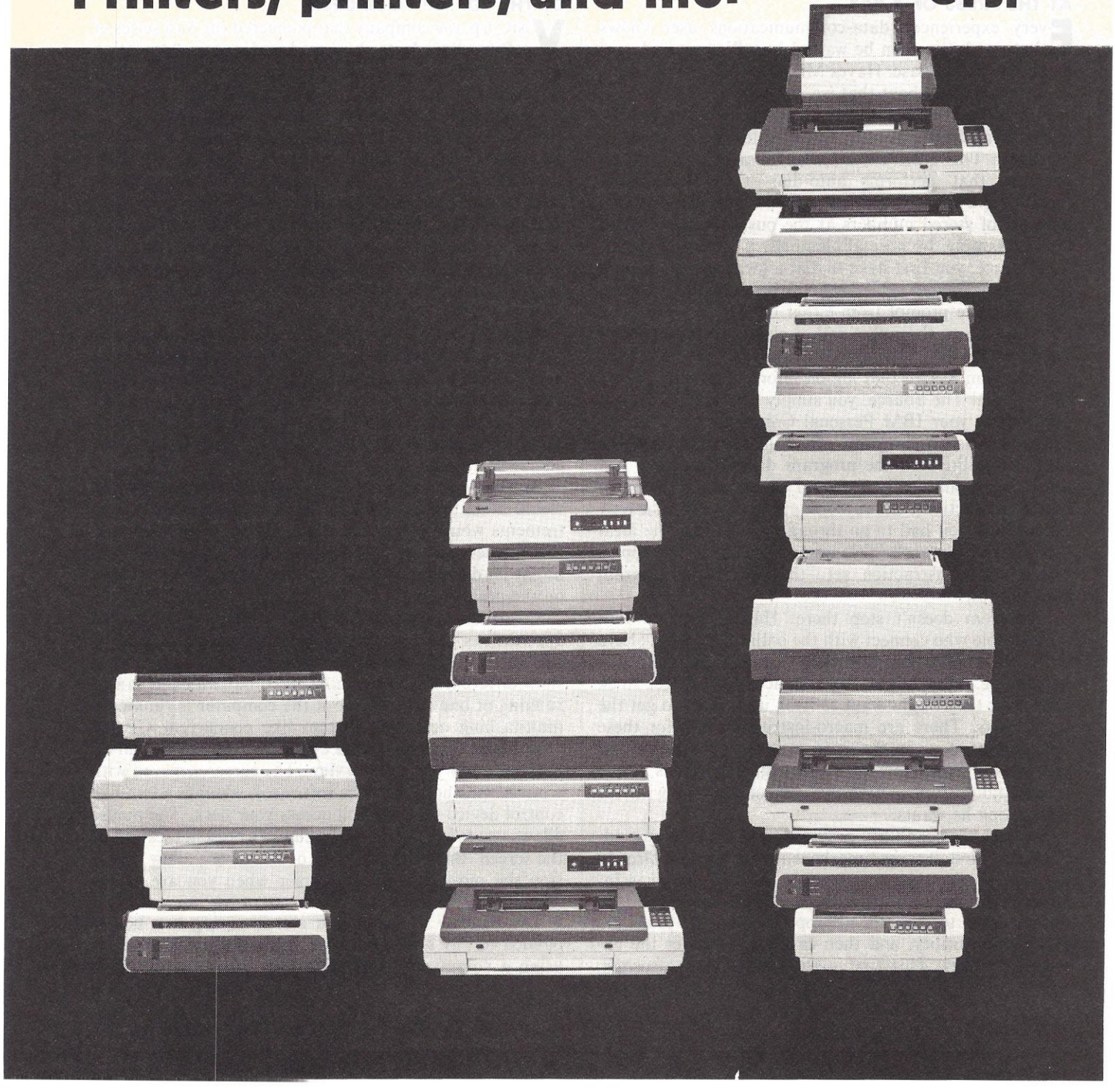
Hundreds of computer systems manufacturers choose Facit/Dataroyal products with confidence, as do a great number of Fortune 500 companies who use Facit/Dataroyal peripherals with their systems.

If you want a trouble-free printer, contact your local computer printer dealer or Facit/Dataroyal, 235 Main Dunstable Road, P.O. Box 828, Nashua, NH 03061, (603) 883-4157.

FACIT DATAROYAL

CIRCLE 41

Printers, printers, and more printers.



ScratchPad

The Ultimate Spreadsheet for CP/M-86®, IBM PC DOS®, and CP/M®

The Ultimate Spreadsheet? YOU BET!

Packed with more important features and performance than any other spreadsheet, ScratchPad is perfect for "what if" analyses and financial modeling of all kinds.

The features tell the story:

Flexible Spreadsheet

A ScratchPad innovation. Now you can design the spreadsheet to fit your application, rather than redesigning your application to fit the spreadsheet. For example, if you need a worksheet that is extremely wide but not very deep, ScratchPad can do it. The matrix dimensions are up to you.

Virtual Memory

Another ScratchPad innovation. When your computer runs out of memory in RAM, your disk drives act as backup memory for additional spreadsheet data. (This is something the VisiCalc and SuperCalc people don't talk about in their ads. They can still run out of memory!)

ScratchPad with a hard disk on the IBM PC, for example, allows in excess of 20,000 entries! NEVER see those disastrous OUT OF MEMORY messages again.

Consolidation

This lets you combine several spreadsheets, adding or averaging the numeric data. It is especially useful to businesses that want to combine data from several departments, or add or average spreadsheets from different months or years. Just another reason why ScratchPad is the ultimate spreadsheet.

These features and many others make ScratchPad the most powerful spreadsheet available! So, find out why we call ScratchPad the Ultimate Spreadsheet.

Write: ScratchPad Information, SuperSoft, Box 1628, Champaign, IL 61820.

This is what others are saying:

Small Business Computers, July/August '82
"In our opinion ScratchPad is an excellent business-oriented spreadsheet program, easy to learn, easy to use, and well documented."

InfoWorld, Sept. 6, '82
"ScratchPad...(is designed) for users who want entry simplicity and fast answers."

Business Computer Systems, Sept. '82
"...a new memory innovation from SuperSoft...ScratchPad('s) virtual memory can accomodate an essentially unlimited number of entries by tapping the disk drive for secondary memory."

Available for IBM PC DOS, CP/M-86 and CP/M.
ScratchPad: $295.00
(Requires 96K with PC DOS, 64K with CP/M-86, and 56K with CP/M)*

Japanese Distributor: ASR Corporation International, 3-23-8, Nishi-Shimbashi, Minato-Ku, Tokyo 105, Japan. Tel. (03)-4375371 Telex: 0242-2723.

European Distributor: Micro Technology Ltd., 51 The Pantiles, Tunbridge Wells, Kent, England TN2 5TH. TEL. 0892-45433. Telex: 95441 Micro-G.

*Additional memory recommended for optimal performance of all features.

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FIRST IN SOFTWARE TECHNOLOGY P.O.Box 1628 Champaign, IL 61820 (217) 359-2112 Telex 270365

CIRCLE 138

DIALING UP A DATA BASE

(continued from page 217)

Smartcom saves money, because the effort of figuring out what is to be done goes on before the computer is ever connected to the information utility. That means the costs of both long-distance time and data-base connect time are minimized.

Hayes seems to have jumped in early on a trend to make personal-computer data communications easier to use, and less expensive. VisiCorp has a similar idea, embodied in a product called VisiLink, that allows users access to the large data base of Data Resources, Inc. With VisiLink the user can tailor the information he wants from the DRI database off line, so his connect-time is limited to the minimum necessary to down-load the information and figure the billing.

If you have data bases in mind other than those Hayes included in the program for you, then you can program those into the Smartcom program yourself. Thus the program is practically unlimited in its range of applications. All you need to access any data base is the ability to subscribe to that data base, the money to pay the connect-time charges (which should be lower with Smartcom than any other program), an IBM Personal Computer with 128k of main memory, and a Smartmodem 1200.

This program was actually written for the Smartmodem 1200, because Hayes has thought for quite a while that none of the software houses that publish communications programs have written one that really takes advantage of the hardware features of Hayes modems. According to Dennis Hayes, president, the company's first response to this perceived shortcoming was the Hayes Terminal Program that runs on the Apple II equipped with a Micromodem II. Smartcom is the second program designed to let users easily tap the capabilities built into Hayes hardware.

Macro-instruction sets included in Smartcom are: Source/Telenet; Dow Jones/Telenet; CompuServe/Telenet; ABBS (Atlanta), (The Apple Bulletin Board); Access (Phoenix); Forum 80 (Kansas City); ABBS (Chicago); ABBS (New York); Source/Tymnet; Dow Jones/Tymnet; and CompuServe/Tymnet. To get to them, you simply boot the Smartcom program, and after it spends some time setting up the Smartmodem 1200, it displays a function menu. When you select the function "Start Communications," you are presented with a menu of destinations from which you can choose to get on line.

To get to specific functions within the database of your choice, you can add to or edit communications sets. Whenever you want to change the information you want to get from your database, this set-editing function is another choice from the main menu.

FOR MORE INFORMATION: HAYES MICROCOMPUTER PRODUCTS, 5835 Peachtree Corners East, Norcross, GA 30092.

A VISUAL COUNTERPART

(continued from page 217)

command, you point the cursor at the four corners of the window and the operating environment stretches the size of the window to correspond to the corners you have selected. If the window you want is smaller than the maximum screen size, that window is laid over the top of the other windows, just as if you laid a pad of paper over other things on the top of your desk.

VisiOn graphs and manages separate tasks on the computer monitor, eliminating the need to scatter paperwork on your desk.

You can also move things from window to window. Suppose that in your budget presentation you wanted to write a narrative description of the budget, then throw in a few columns of figures, and then add a graphic representation of those figures. With the mouse you can easily transfer the figures from a spreadsheet window to your text window; you can also move the graph from the graphics window to the text window. When your document is assembled, you can print out a hard copy of what you've created on the screen.

There are three things that are especially nice about VisiOn. The first is its structure. The program is written in what can be thought of as two layers. The innermost

(continued on page 225)

HAYDEN SOFTWARE. THE MIND-STRETCHERS.

From this page on, your computer is going to be more valuable to you than ever before.

You'll get more fun out of it. More education. More of everything you bought your computer for.

All because you're going to see what Hayden Software can do for your computer, and you.

You can choose from dozens of Hayden games and educational programs, with new ones coming out all the time. But they all have one thing in common:

Hayden

they're designed to help you stretch your mind . . . and your computer.

Take Bellhop. On the surface, it's such a simple game. You merely pick up a rich guest's luggage in the hotel lobby, take an elevator to the penthouse and collect a fat tip.

Not so fast. The elevator's never there when you need it. And there's this lug-gage-grabbing ghost loose in the hotel, ready to throw those bags back down to the lobby. If *you're* not fast, your tips go down . . . fast.

Yes, for a Bellhop, life certainly has its ups and downs.

But when you start plugging Hayden Software into your computer, it's all up for you.

Now, let the games—and the learning—begin.

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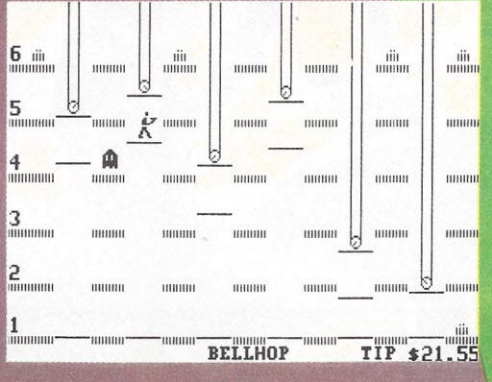

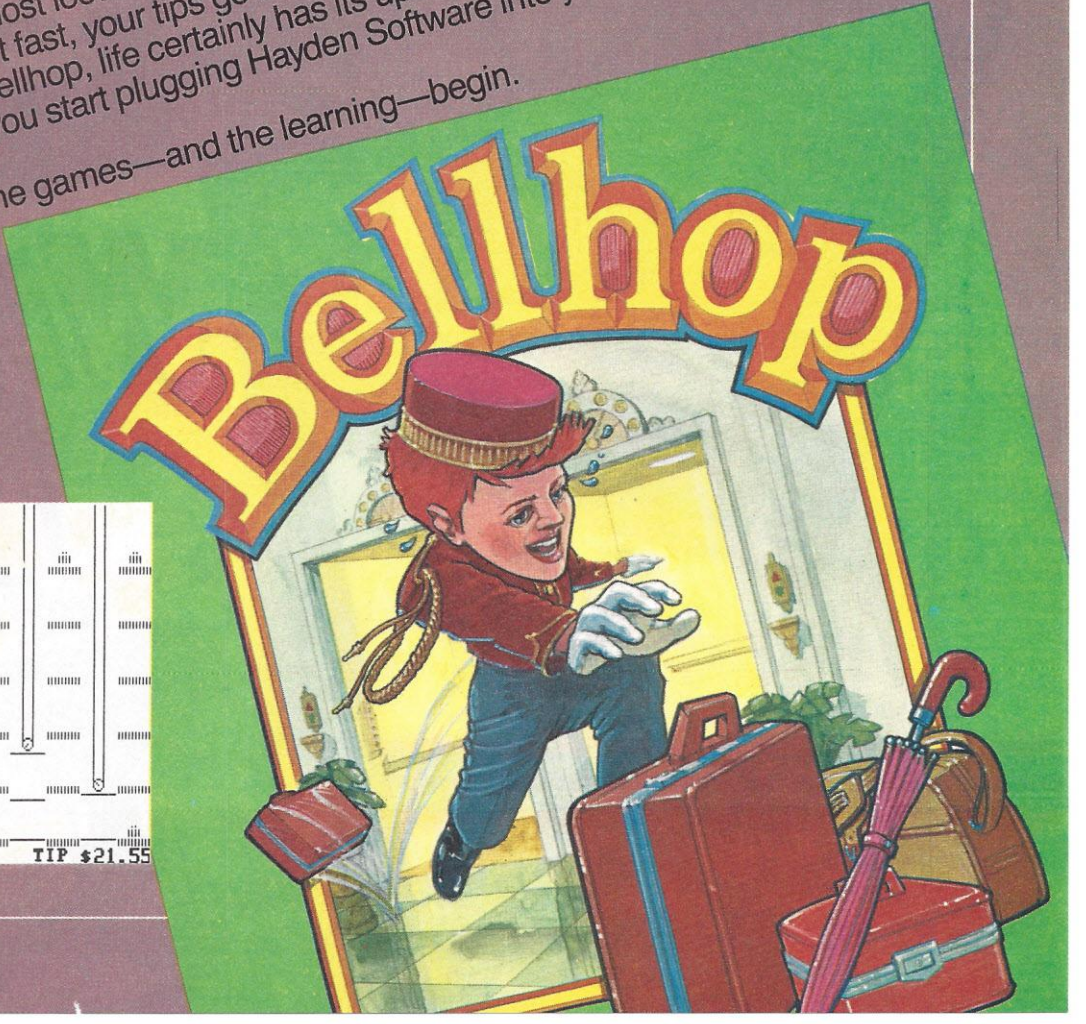

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"Wargle," on the other hand, is a very modern affair, involving attacks on you by a pack of vicious wolves. Outshoot them and they merely regroup and come at you with greater ferocity. Just when you think you're getting good at this game, you'll find yourself at a new, more dangerous level.

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Easy.

Play more Hayden games.

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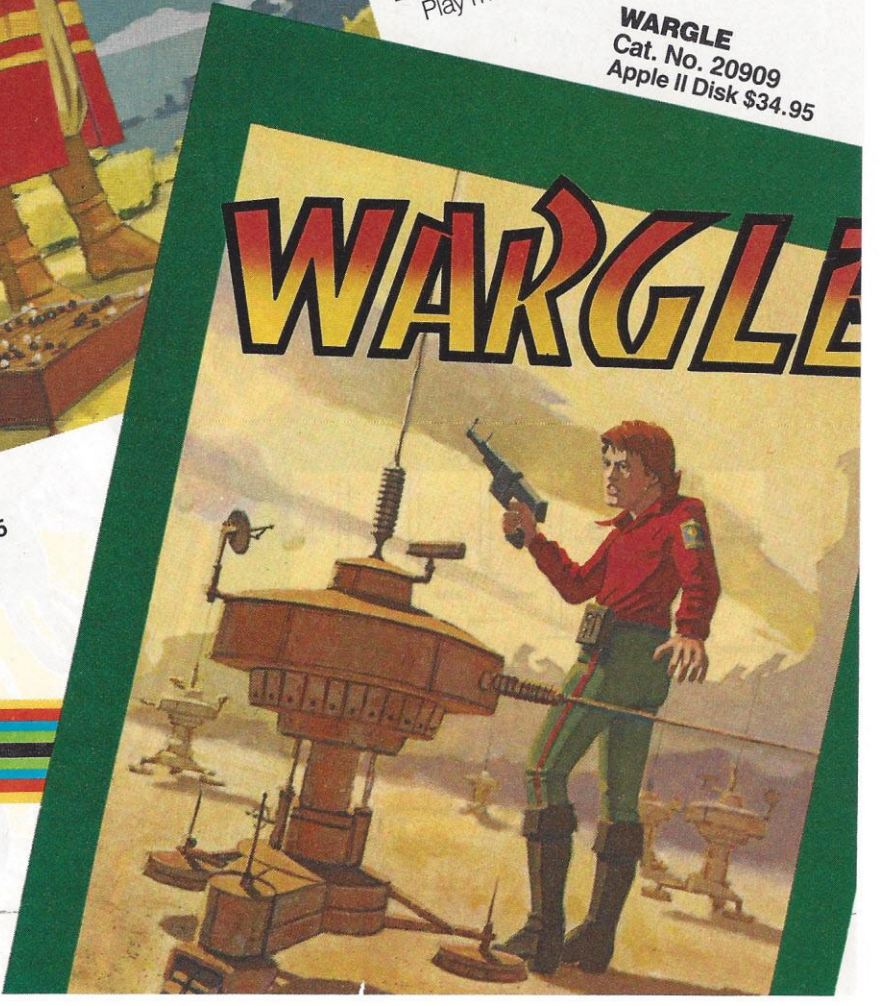
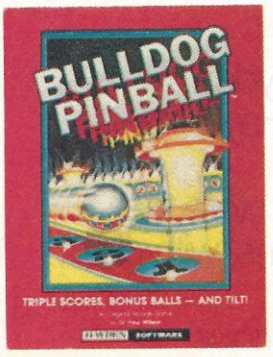
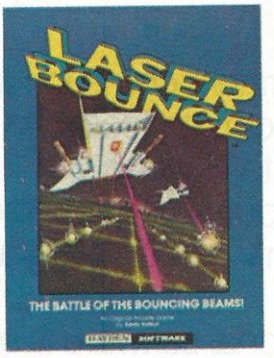


THE GAME SAYS "PLAY ME!"

GAMES FOR WHEN YOU CRAVE ACTION





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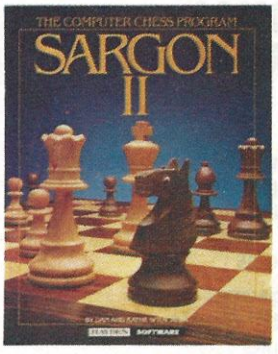
GAMES FOR WHEN YOUR BRAIN NEEDS A WORKOUT



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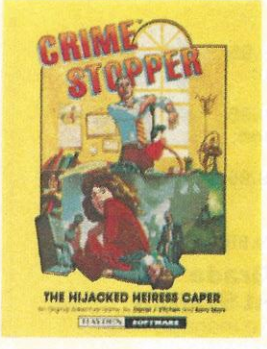

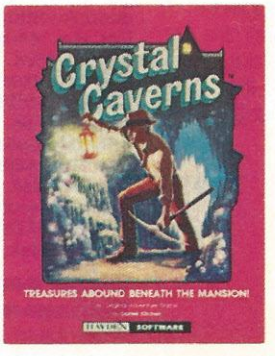

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If you want to learn to type faster, more accurately, come to Hayden.

If you want to teach your preschooler basic math, come to Hayden.

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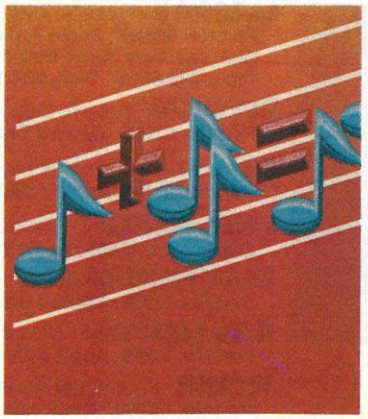
MUSICAL MATH



Full color, H I-RES graphics, animation, sounds and songs make this the perfect computer math game to introduce preschoolers to addition, subtraction, multiplication and division. For older children and adults too—as your skills progress, the game gets increasingly difficult.

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A VISUAL COUNTERPART

(continued from page 220)

layer is called VisiHost, and resides deep inside the program. VisiHost interacts with the operating system—CP/M, MS DOS, or others. The outer layer is the one that provides the consistent user interface. Since the outer layer needs to communicate with VisiHost only on the machine side, the commands are the same for all computers. The only part of the package that needs to change for the software to interact with different kinds of computers is VisiHost.

From the user's point of view, VisiOn is independent of the specific machine—you do not have to learn a new procedure if you work on different machines. In fact, at the time VisiCorp first publicly displayed the product at the recent Comdex show in Las Vegas, it was shown on an IBM Personal Computer at the VisiCorp booth, and Digital Equipment Corporation announced plans to provide VisiOn on its line of personal computers.

The second nice thing about VisiOn is the price. While VisiCorp is cagey about the price of the final product—it won't be available until this summer and pricing is, therefore, still up in the air—Terry Opdendyk, VisiCorp president, says the pricing will be "very aggressive. We want to price this product so that the price won't be an obstacle to purchase." Pinned down, Opdendyk and Fylstra talked about prices in the neighborhood of $4000 for the hardware, with enough memory to run VisiOn (at least 128k and two disk drives) and the software, and the mouse.

The third nice thing is the product's universality. VisiCorp proposes to make the interfaces to the product public knowledge. That means independent software vendors will be able to integrate their applications into VisiOn's operating environment. This action should broaden applicability of the product.

Fylstra also says that users with other Visi series products will be provided a way to upgrade their software and have it run in the VisiOn format. Fylstra declined to mention specific details of how this upgrade would be provided.

FOR MORE INFORMATION: VISICORP, 2895 Zanker Rd., San Jose, CA 95134.

NEW SOFTWARE ABOUNDS FOR ACCOUNTING AND WORD PROCESSING

Hayden Software Company has introduced three new products this month: Hayden Basic Accounting System, a CP/M-based package designed for small businesses and first-time users; Pie Communications, for the Apple II; and Pie Spell, for the IBM Personal Computer.

Hayden Basic Accounting System is comprised of five modules—General Ledger, Accounts Payable, Accounts Receivable, Payroll, and Inventory—each priced at $449.

The system operates like a manual accounting system in order to help the novice user quickly understand how it runs. This means that instead of using the "card/batch" method of most computer accounting software, the five modules take each transaction to its logical conclusion before accepting data for the next transaction.

The General Ledger module can be used in conjunction with the other four programs Hayden offers, or it can be used independently. It catalogs accounting periods, prints out comparative reports, monitors account numbering, and is prepared to tackle a wide variety of custom reports.

The Accounts Payable module manages cash disbursements, determines cash requirements, and ensures that a minimum of money is tied up in-house. It also features single-step operation, validity checks, an unpaid invoice list, and an unpaid item worksheet.

Similar to, but faster than a manual system, the Payroll module calculates state and local taxes, earnings and deductions, automatic deductions, manual checks, multiple checks, quarterly reports, and can be integrated with the general ledger.

The Accounts Receivable module can compute an extensive sales analysis, automatic breakout of sales tax and miscellaneous charges, selective posting, partial payments, inquiry, credit limits, finance charges, sales reports, sales catagories, and aged accounts analyses.

The Inventory module operates independently, providing an item by item basis for up-to-the-minute analyses of inventory stock levels, product sales performance, and profitability. It features single-step operation, product grouping, costing, selling prices, physical inventory, and adjustments.

Pie Communications, which is a complementary package to Hayden's Pie Writer word processor, is an advanced commmunications system which allows an Apple computer to serve as a terminal and communicate with other Apple computers by phone, via a Hayes Micromodem II. With this package, a user can send and receive messages, letters, or documents.

Pie Communications, priced at $99.95, can be used with Pie Writer to edit and format text, or it can be used independent of Pie Writer, in which case the data is stored on a Pie Communications disk.

Pie Spell, another Pie Writer-based package, is a 20,000-word electronic dictionary that checks text processed on Pie Writer. The program automatically indicates incorrectly spelled words or words not in its dictionary. The user can also update Pie Spell's dictionary with new words.

Pie Spell is priced at $99.95 and is used with the IBM Personal Computer and Pie Writer.

FOR MORE INFORMATION: HAYDEN SOFTWARE COMPANY, 600 Suffolk St., Lowell, MA 01853; (617) 937-0200.

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allows math calculations from within Wordstar

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IUS-IBM acct. sys.	CALL!

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Novation D CAT	157
Novation AUTO CAT	213
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Videx KEYBOARD ENHANCER	119
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Includes: Z-80 Softcard, 16K Ramcard, Videx Videoterm, and CP/M User Guide.

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RANA II-326K	529
RANA III-652K	699
RANA with controller	479
Hayes MICROMODEM II	289
SVA 256K APP-L-CACHE	949
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Mountain SUPERTALKER	262
M & R SUPERFAN	38
GRAPPLER PLUS	125
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DEALERS INQUIRIES WELCOME

WE WANT YOU TO KNOW ...

MICROHOUSE

SOFTWARE OF THE MONTH

WORD PROCESSING FOR THE COMMODORE VIC-20 AND 64

A full-featured, letter-quality word-processing work station is now possible for under $2000, according to the Quick Brown Fox company. When used with the Commodore VIC-20 or 64, the Quick Brown Fox program offers greater versatility and more features than higher-priced programs, the company says.

The Quick Brown Fox program features full-line and global-edit capabilities, text moving, boilerplating, tab and margin settings, right justification, and proportional spacing. The program also automatically reformats edited text. The user can edit even with the VIC-20's standard 22-column width.

Quick Brown Fox is developing a marketing strategy around the concept of assembling a complete work station (including letter-quality printer and 80-column board) for less than $2000. "This is why we're calling it the '$2000 breakthrough,'" says Joseph Ming, the company's vice president. "With our feature-packed Quick Brown Fox software, however, a user can put together a work station that includes letter-quality printing, 80-column display, plus ample internal and disk storage." Ming concludes.

The Quick Brown Fox package will be distributed through direct mail order and a dealer network. The package costs $65.

FOR MORE INFORMATION: QUICK BROWN FOX, 548 Broadway, New York, NY 10012; (212) 925-8290.

MAKING THE APPLE TO IBM CONNECTION

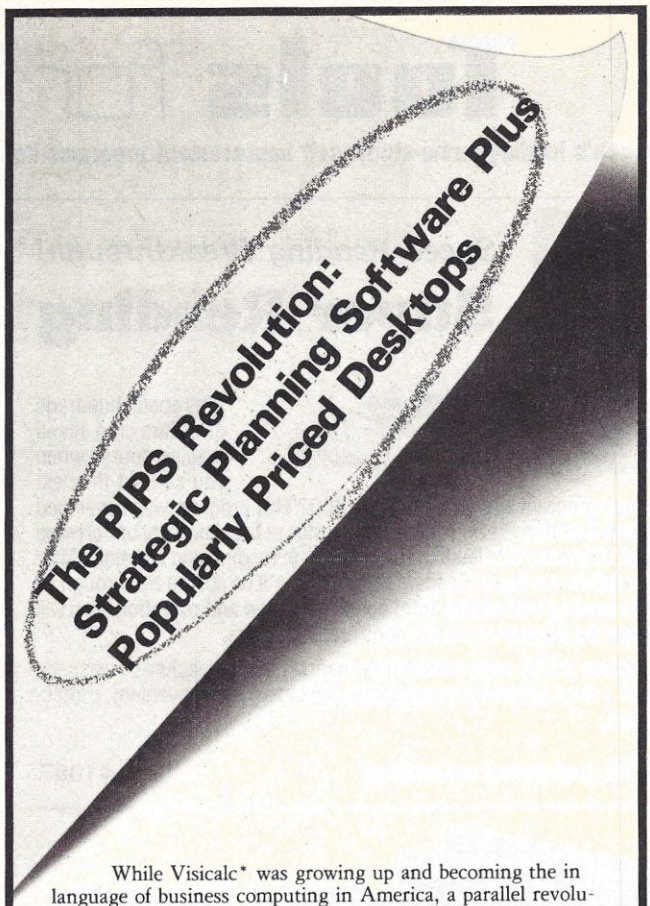
The Apple-IBM Connection, from Alpha Software Corp., allows users to easily transfer information back and forth between the Apple II and the IBM Personal Computer. In minutes, the software reportedly duplicates files created on one machine and transfers them into files that can be used on the other machine.

Among other things, the Apple-IBM Connection program allows users who have been developing VisiCalc models for several years on Apple II computers to automatically transfer the same models to VisiCalc running on the IBM Personal Computer—without investing hundreds of hours re-entering the data manually. The software also allows for the transfer of written information developed under the WordStar word-processing program.

"The Apple-IBM Connection software gives personal-computer users the freedom to choose which kind of computer best serves their needs," says George Lechter, director of product development for Alpha Software. "Incompatibility between the Apple II and the IBM Personal Computer is no longer a concern."

In addition to transferring files, the package can be used to send and receive electronic-mail messages be-

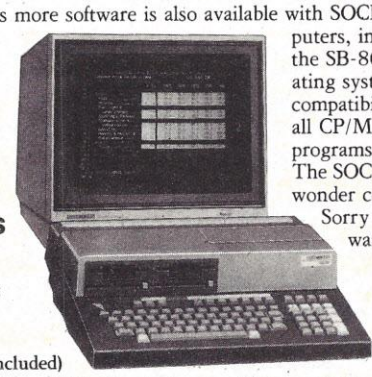
(continued on page 230)



While Visicalc* was growing up and becoming the in language of business computing in America, a parallel revolution has been taking place in Japan. SORD Computer Systems, Japan's fastest growing company, made it happen with PIPS, a sophisticated non-programming business system. PIPS is actually far superior to Visicalc for business purposes. It can do anything that Visicalc, Visifile*, or Visiplot* can do plus a lot more—and a lot more easily. PIPS is perfect for strategic computing applications like marketing and product pricing, and you don't need computer experience to put it to work for you.

The PIPS revolution is about to happen here, too. PIPS is now available with a wide range of desktops from SOCIUS. There's the M23P: a portable desktop with 2 built-in microfloppy drives, a Z-80A microprocessor and 128K of RAM—so light and compact, it travels in a briefcase, yet is more powerful than many larger computers. There's also the M343: a compact giant with a 16-bit microprocessor, a high-speed arithmetic processor, 256K of RAM, color graphics with a 1024 × 1024 dot memory, multi-terminal timesharing capability, communications interface and more.

Lots more software is also available with SOCIUS computers, including the SB-80* operating system for compatibility with all CP/M*-based programs. The SOCIUS wonder computers. Sorry to keep you waiting.



SOCIUS M23P
Suggested retail price:
$2395
(CRT not included)

*Visicalc, Visifile, and Visiplot are trademarks of Visicorp. SB-80 and CP/M are trademarks of Lifeboat Associates and Digital Research Inc. respectively.

SOCIUS

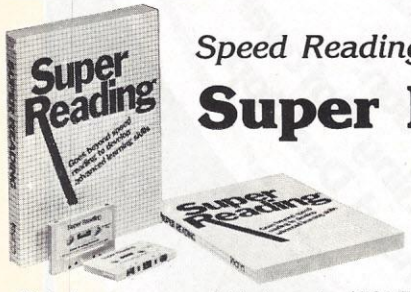
SORD Computer of America, Inc.

c/o Mitsui (U.S.A.) Inc., 200 Park Ave., New York, N. Y. 10166-0130
Attn: M. Taketani or M. Kitamura, Tel: 212-878-4403

CIRCLE 133

Tools for Success

America's leading home-study, self improvement programs designed to make you a winner in your career and personal life.



Speed Reading Breakthrough!

Super Reading

Why spend hundreds of dollars on a speed reading course when you can get the best self-study program available for under $50? This program was developed by Russell Stauffer, Ph.D., Professor Emeritus at the University of Delaware and one of the world's leading researchers in reading and learning. After you complete the Super Reading program you'll be able to zip through all kinds of reading with almost **total comprehension and retention.** You will no longer be bogged down by poor reading habits.

You receive a 288 page instruction manual, and a teacher-on-cassette (almost 1 hour of spoken instruction) packaged in a convenient, protective case.

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Assert Yourself...

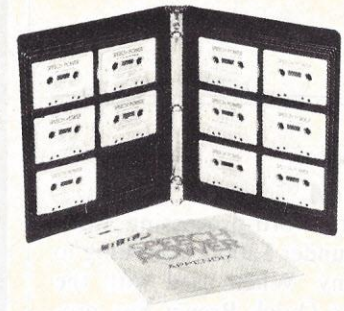
Self-Directed Assertiveness Training

Now, learn to be **constructively-assertive.**

You'll become assertive without becoming aggressive. Originally developed for use by professional counselors (psychiatrists, psychologists, etc.), this fine program is now available to you. You'll learn how to think rationally; how to assess the "risks" of being assertive in any given situation; when NOT to assert yourself; when and how to say "no"; and much more.

Created by Richard Rakos, PhD and Harold Schroeder, PhD, the program contains four cassettes, a 56-page workbook and a 16 page practitioner's manual packaged in an attractive bookshelf case.

$59.95 (plus postage and handling) **#1003**



Learn the art of conversation and never be at a loss for words again.

Speech Power

This amazing program, developed by University language experts and professional broadcasters, is a **must** for anyone who has to deal with people everyday and wants to leave a favorable impression. Here's a summary of what you'll learn. How to:

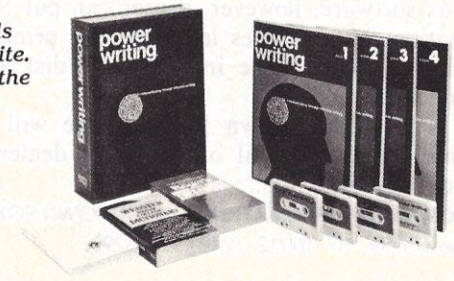
- skillfully employ humor
- "break the ice"
- understand "body language" and how to use it
- speak before groups
- debate and argue
- eliminate "ughs," "ahs," "ya knows" and other undesirable expressions.

This is a **must** course for anyone looking to move ahead socially or at work.

$99.95 (plus postage and handling) **#1148**

Your career depends on the way you write. Now, you can win the battle of words.

Power Writing



This is the program that's helping thousands of executives sharpen their writing skills. They learn to communicate better, motivate others, sell their ideas and get their desired results. **Now you can, too.** It's co-authored by Robert R. Max, a world-acclaimed communications consultant whose clients include American Express, AT&T, Johnson & Johnson, among others and Sally Cerny, former Supervising Editor at McGraw Hill. The program consists of four workbooks, four cassettes and a three-volume Writer's Reference Library, all packaged in a handsome bookshelf case. Power Writing can help make you a winner.

$99.95 (plus postage and handling) **#1001**

Will learning a second language increase your earning power, and make you more valuable to your company? Are you planning a trip abroad? If YES, this "NO-TIME" Language Method is for you.

No-Time Languages

This method doesn't use any printed material—ONLY CASSETTES. You learn by listening while driving, gardening, walking, doing household chores or whatever. That's why it requires practically NO-TIME!

The courses are introduced by A. E. Van Vogt, a well-known writer and language expert, who has a copyright on this method. The courses are introductory-level and help you master the basics of the language for business or travel.

The grammar and sentences are contemporary, not simplistic. This method gives you a practical working use of the language by hearing only—and it does work.

Choose from four languages offered:

Spanish	**$99.95**	(plus	**#1008**
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Don't be embarrassed by your grammar, spelling and punctuation again.

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Here's an entirely new program, developed for corporate executives. This course recognizes that you probably have difficulty with only a few areas of grammar and usage. So why review an entire grammar course just to correct a few areas? A simple assessment test diagnoses your skills, pinpointing areas of strength and weakness. You then review only those sections of the Review & Instruction Manual that apply. Finally, a Mastery Measurement confirms your improvement. There's a "teacher-on-cassette" to guide you through the program **plus** one of the best reference handbooks available . . . How To Achieve Competence in English.

You receive all the materials described, plus, you gain the confidence of knowing that you'll never be embarrassed by your grammar again.

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How's your vocabulary?

The Bergen Evans Vocabulary Program

There seems to be a definite correlation between success in business and the size of one's vocabulary. As your career expands in business or profession you need "the right words" to explain your thoughts, ideas and concepts.

The most highly respected program ever designed for students and business people is the Bergen Evans Vocabulary program. Each of the five cassettes that make up the program contains 100 words . . . 500 in all. By playing each tape several times you hear the correct pronunciation and usage as they become firmly imbedded as part of your vocabulary. A special Review Manual is included so you also see the word, see how it's spelled and test yourself on its use.

Bonus! with your purchase of the vocabulary program — *The Art of Listening ($10.95 value)* **Free!**

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☐ variable-length fields ☐ field names of any length ☐ field names may include spaces ☐ sequential or random files ☐ optional index files ☐ also runs under CBASIC

INTERACTIVE PROGRAMS

Tarbell Database also includes these interactive programs: DBSORT, sorts random files; DBSETUP, creates a file; DBENTRY for entering data; DBUPDATE for changing files; DBQUERY for accessing data; DBLABEL for printing labels; DBLETTER for printing letters; DBCOPY to change structure of a file.

TARBELL VALUE

Dollar for dollar, you can't get a better value than Tarbell's updated Database System. Ask your nearest Tarbell dealer for a demo.

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CIRCLE 165

YOU'LL HAVE MORE FUN WHEN YOU PLAY BY THE BOOK

THE SURVIVAL KIT FOR APPLE COMPUTER GAMES is the **only** book that gives you the play-by-play on two dozen of the most exciting home computer games. Covering games in four categories —Adventure, Arcade, Fantasy, and Strategy—the book's not too sophisticated for beginners, yet packed with plenty of challenges for avowed computer game freaks. For each game you'll find detailed, fun-to-read descriptions, winning strategies, tips from experts, and a quality rating. All the games run on an Apple and hardware specs tell you at a glance what other machines can be used (many games run on the Atari 400 or 800, the TRS-80, and the IBM PC).

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THE SURVIVAL KIT FOR APPLE COMPUTER GAMES is also available at your local computer dealer. If not, have them contact Wadsworth Electronic Publishing Company.

CIRCLE 122

SOFTWARE OF THE MONTH

(continued from page 227)

tween the Apple II and the IBM Personal Computer, as well as from Apple to Apple and from IBM to IBM.

Designed for non-technical users, the package not only comes with complete documentation written for business people and professionals, but it also includes a cassette tape that verbally introduces users to the program through an interactive demonstration. According to the company, the program employs simple English commands and offers straightforward, easily understood screen menus that indicate the steps required to transfer files.

The Apple-IBM Connection program comes with floppy disks for the Apple II and the IBM Personal Computer. Once the connection is made, either through a direct cable or through a telephone modem, the user can put the program into action in a simple three-step process that is completed in less than five minutes. Files are automatically transferred from one machine to the other at rates of up to 100 characters per second—or less than a minute per page of written text.

Because the program allows either machine to operate in a "master" or "slave" mode, the users can control communications from either personal computer. With an automatic answering modem, one person can transfer files through telephone lines, even if the computers are located miles apart. The software also incorporates extensive automatic error-checking procedures to ensure that files transferred from one machine to the other remain exactly the same.

Priced at $195, the Apple-IBM Connection program is available at Computerland stores as well as at many independent computer retail stores offering the IBM Personal Computer.

FOR MORE INFORMATION: ALPHA SOFTWARE CORPORATION, 6 New England Executive Park, Burlington, MA 01803; (617) 229-2924.

SOFTWARE INDEX

A COMPREHENSIVE LISTING OF NEW PRODUCTS

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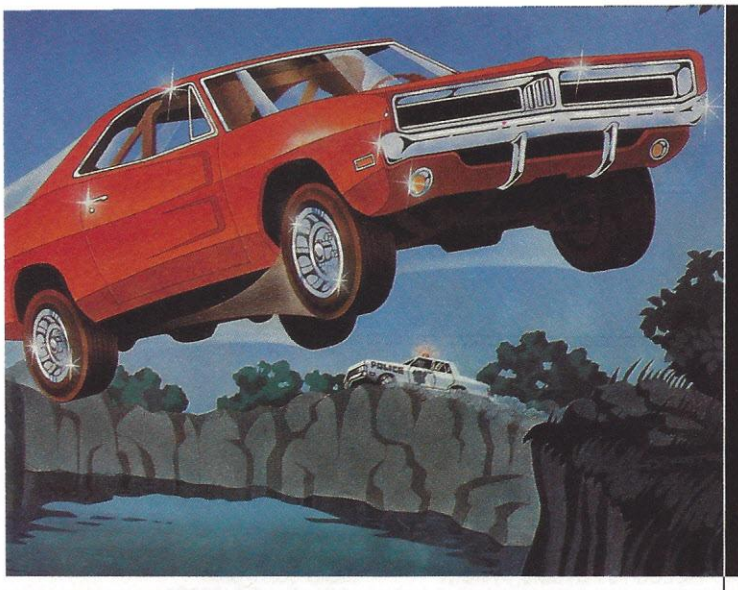
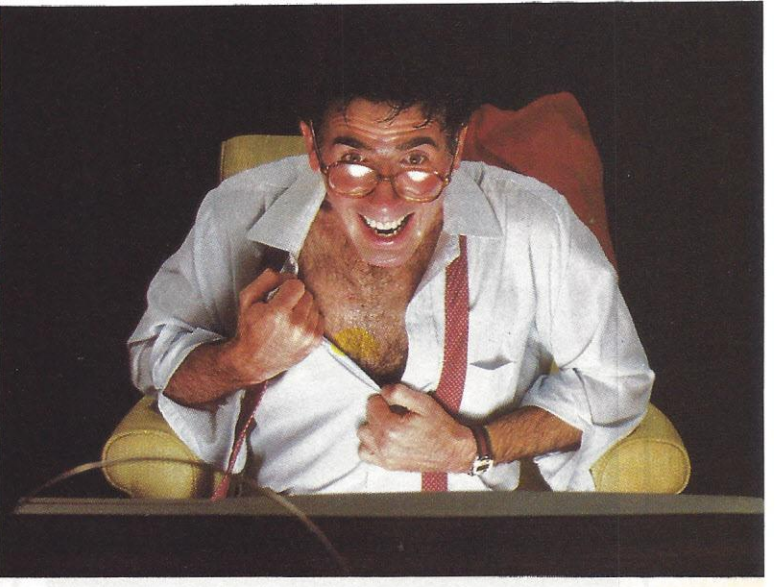
PRODUCT/FEATURES/PRICE	COMPANY/AVAILABILITY
ABS/86 a complete business package of accounting, word-processing, spreadsheet and tutorial applications that runs under a menu-driven business "shell" making the applications and the XENIX/UNIX operating system readily accessible for Altos ACS8600 $4080	Altos Computer Systems San Jose, CA 95131 retail or mail order CIRCLE 375





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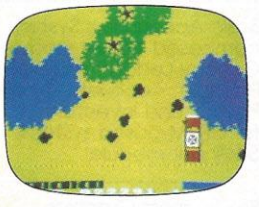
Grab the wheel in *Hazard Run,* our high-speed cross-country chase . . . and watch the feathers fly! This exciting game features four progressively tougher runs, plus one random run. Smash through the brush, snake around trees and boulders, leap ponds in a single bound, and maneuver on just two wheels. It's all part of the fast moving, fine-scrolling white-knuckle action of *Hazard Run,* 100% assembly language play that flexes your Atari graphics to the max! For more fun than the law should allow, get *Hazard Run* at your local computer store, or write or call today.



Program by Dennis Zander

100% assembly language program for the **ATARI 400/800**
16K Cassette $27.95 24K diskette $31.95

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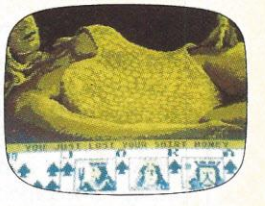

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New! Computer table and desk in one.

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No more crowded tables.

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Now you can quickly adjust your computer workstation to position the keyboard and video display terminal (VDT) for your personal comfort. Both the 24-inch by 48-inch desk surface and upper VDT shelf adjust quickly and easily to accomodate child or adult.

Upper shelf is 18-inch by 36-inch—big enough and strong enough for even a portable TV. Need more space for storage? Order your Computer Desk with one, two, or three adjustable shelves that hook on the back. Want to place your unit against a wall? Simply remove inserted back leg supports.

The Slager System Computer Desk frame is made of sturdy 1¾-inch tubular steel. Desk and shelves have mar-proof high-pressure brown laminate surfaces that match the frame. With Slager System locking cross-member (patent pending), the desk is assembled and disassembled in minutes.

WRITE OR PHONE ORDER TODAY

Presently available only direct from the factory. Price, $250 (plus sales tax), includes shipping and handling. Optional rear shelves are $45.00 each.
Ten day trial. If not 100% satisfied, return desk prepaid within ten days for full refund.

VISA and MASTERCARD accepted.

To order by mail, send check or credit card number (and card expiration date) to: **O/I Inc., 1314 South Main, P.O. Box 1871, Elkhart, Indiana 46515.**

To order by phone, call **219/522-3498** ($5 refund for toll call with phone order).

CIRCLE 137

SOFTWARE INDEX

Accounts Payable an accrual system that incorporates accounts payable, aging, and general ledger distribution for TRS-80 Models II and 16 Model II: $499; Model 16: $599	Radio Shack Ft. Worth, TX 76102 retail see this product at your local Radio Shack store or Computer Center
Accounts Payable System includes vendor support, voucher processing, check processing and period-end processing; handles fixed term and perpetual-type recurring payables for CP/M-based and MS/DOS-look-alike-based systems $395	Solid Software Atlanta, GA 30328 retail CIRCLE 377
Accounts Receivable can shape itself to the needs of almost any business with a powerful ability to chart and report the status of open accounts for TRS-80 Model II and 16 Model II: $499; Model 16: $599	Radio Shack Ft. Worth, TX 76102 retail see this product at your local Radio Shack store or Computer Center
Basic Accounting System composed of five modules—General Ledger, Accounts Payable, Accounts Receivable, Payroll, and Inventory for CP/M-based systems $449 per module	Hayden Software Company Lowell, MA 01853 see story on page 225 mail order CIRCLE 473
BPS Business Graphics enables users to create a variety of multicolor charts and graphs using simple, English-language commands for IBM Personal Computer $350	Business & Professional Software Cambridge, MA 02142 retail CIRCLE 377
COMMA medical management system featuring total accounts receivable control with variable period aging reports, delinquency notices, daily cash reports, statements, journal, and day sheet for Apple II Plus $1495	Spectra/Soft, Inc. Chandler, AZ 85224 retail CIRCLE 378
Database Manager database tool which allows the user to create his own reference/resource files as he wants them for Northstar Sol-20 and S-100 $149.95	Minnetonka Software Paramus, NJ 07652 mail order CIRCLE 379
Dental Office Management IIC designed to assist in patient scheduling, patient diagnostic records management, general word processing, private patient billing, and third party claims form	CMA Micro Computer Yucca Valley, CA 92284 retail or mail order CIRCLE 380

(continued on page 238)

Now we've made Accounting Plus II™ even more tempting... Payroll Plus.

If you think computerized payroll simply means paychecks and W-2's, then our versatile *Payroll Plus* will really tempt you. It brings a new dimension to our Accounting Plus II — the industry standard for all Apples.

Payroll Plus handles records for as many as 300 employees. Logs sick and vacation time. Pays by wage, salary, commission or piece rate. Voids checks. Registers multiple pay periods. Compiles costs by project. But that's not all. *Payroll Plus* stores data for government forms, and compiles deposits for taxes, insurance and Social Security. It even computes local taxes.

Give in to temptation. Turn your payroll over to *Payroll Plus*.

Operates with Accounting Plus II™ or as a stand-alone

Payroll Plus is a special feature of *Accounting Plus II*. It operates with either floppy disk drives or hard disks. If you use another accounting system, you'll be glad to know *Payroll Plus* also works as a stand-alone package.

See your Apple dealer for a demonstration and complete details.

Software Dimensions, Inc.
6371 Auburn Boulevard
Citrus Heights, CA 95610
916/722-8000

CIRCLE 123

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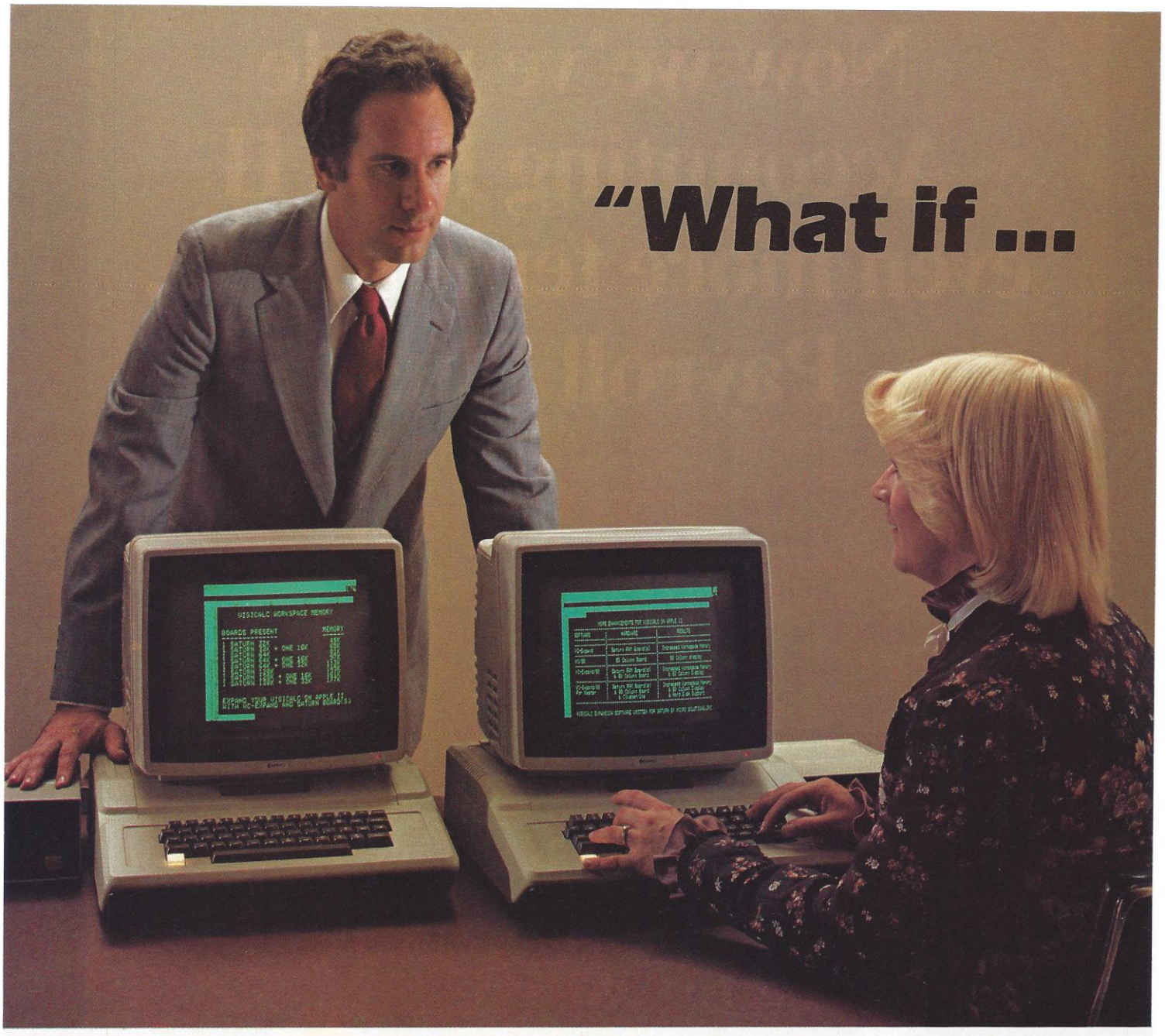

I run out of memory?"

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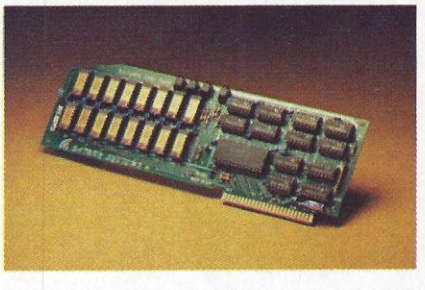

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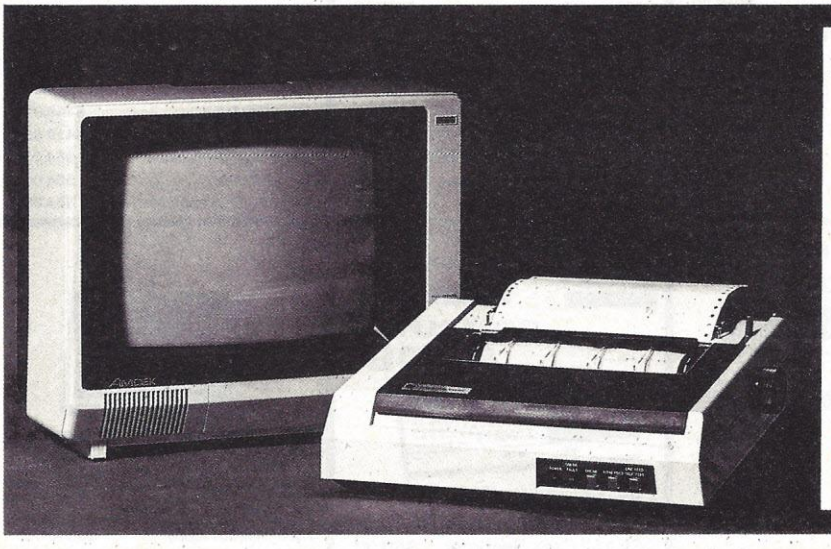

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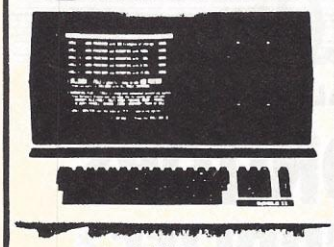

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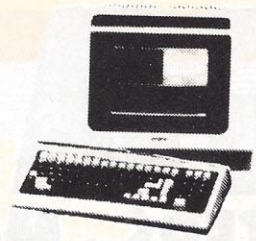

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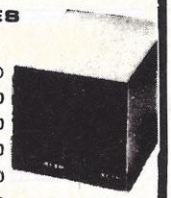

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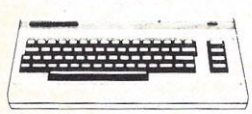

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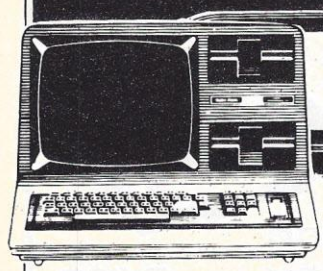

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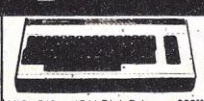

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(continued from page 232)

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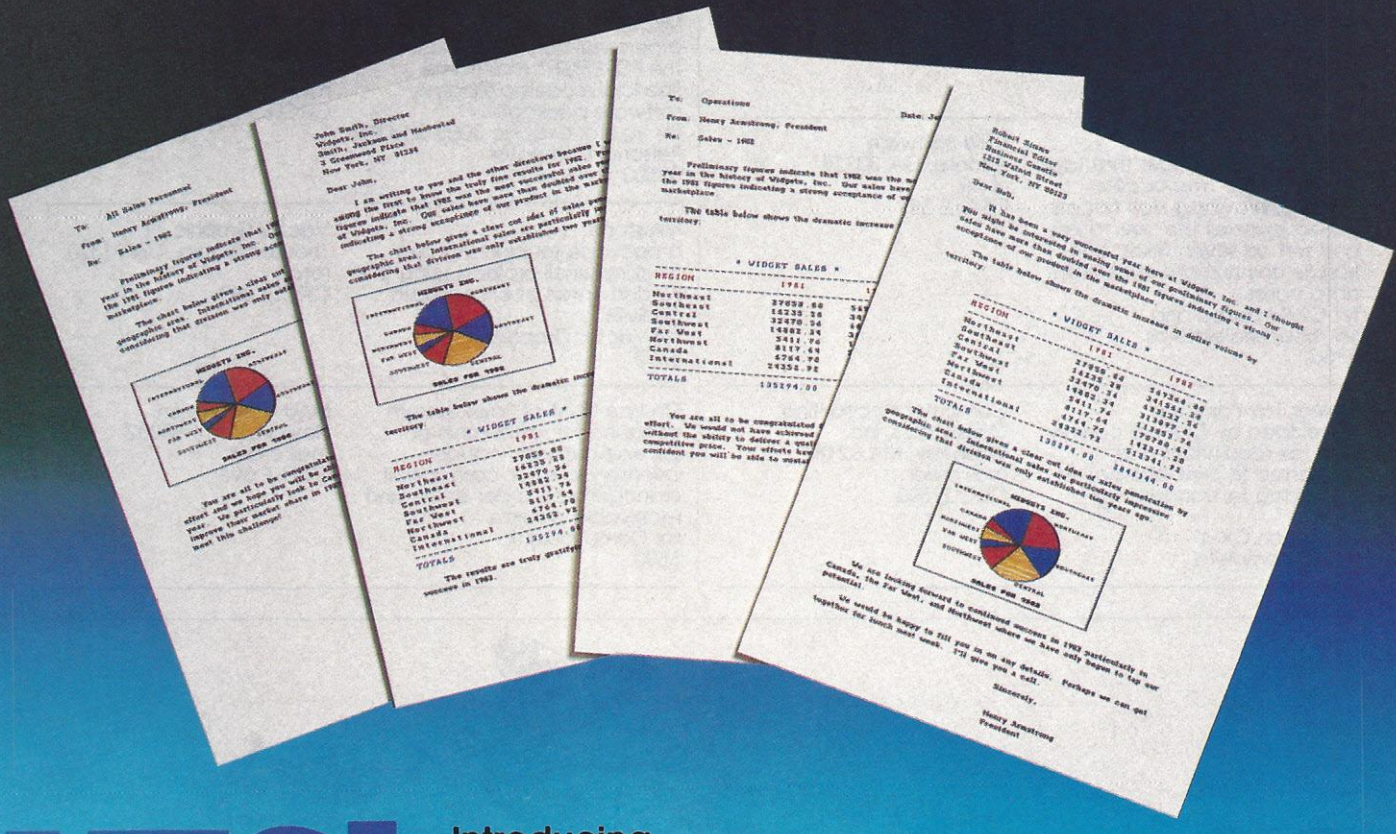

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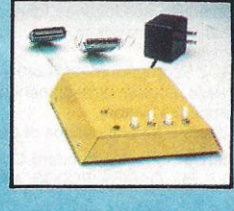

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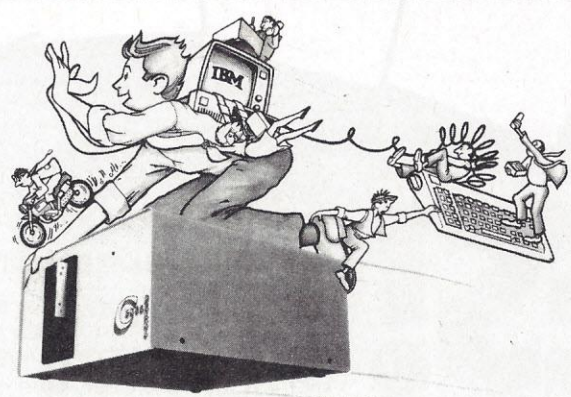

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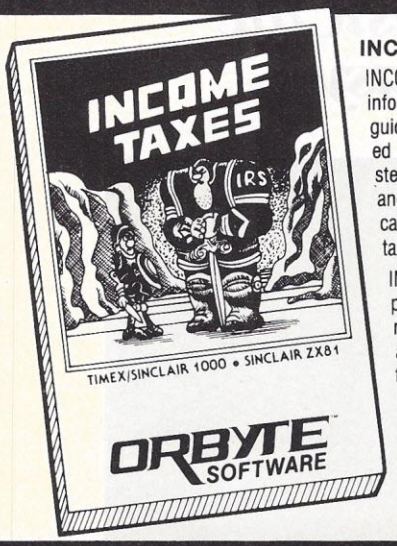

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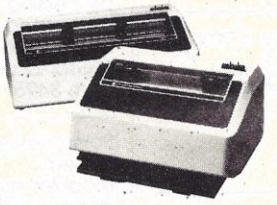

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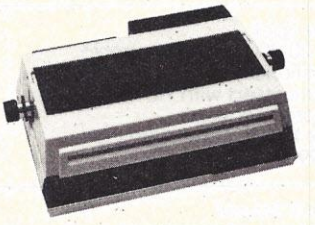

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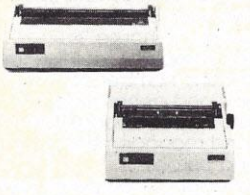

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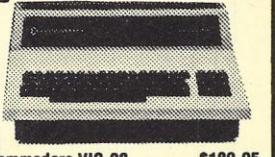

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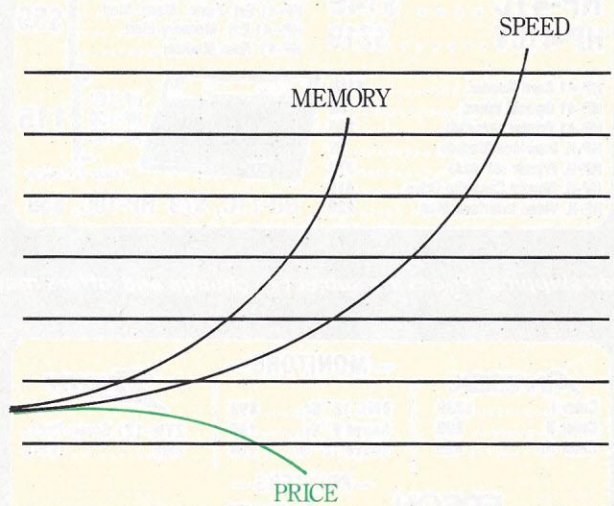

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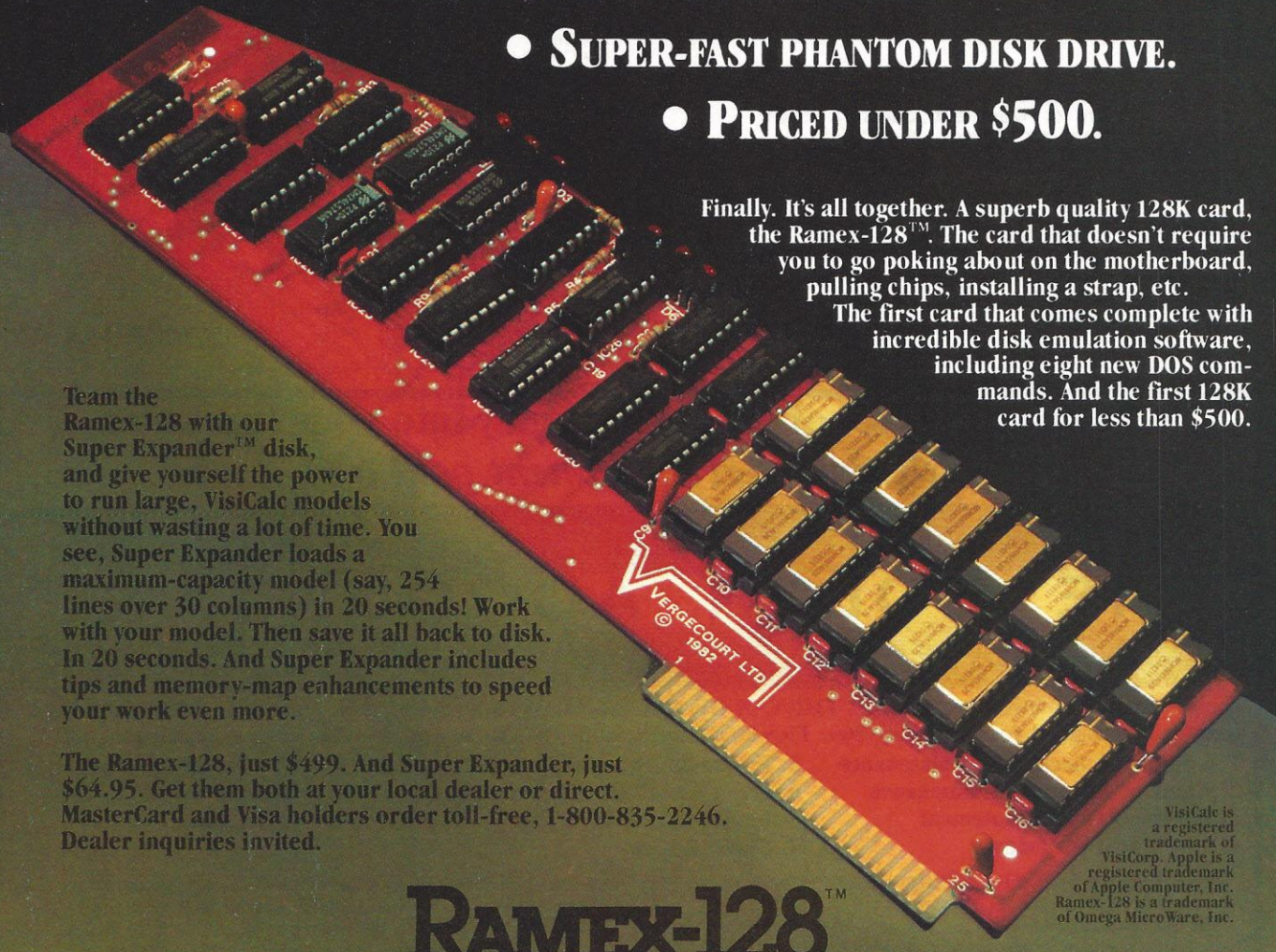

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(continued from page 244)

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(continued on page 252)

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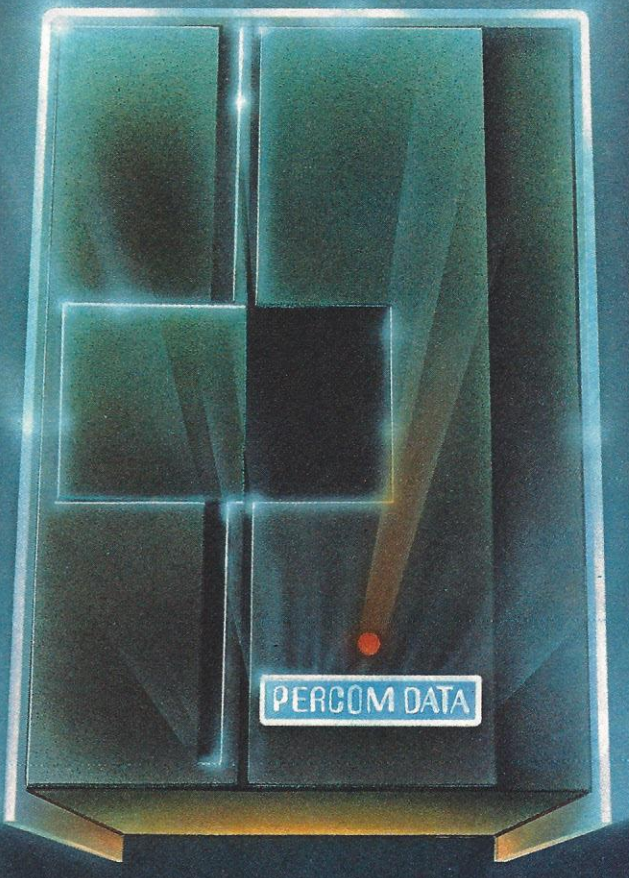

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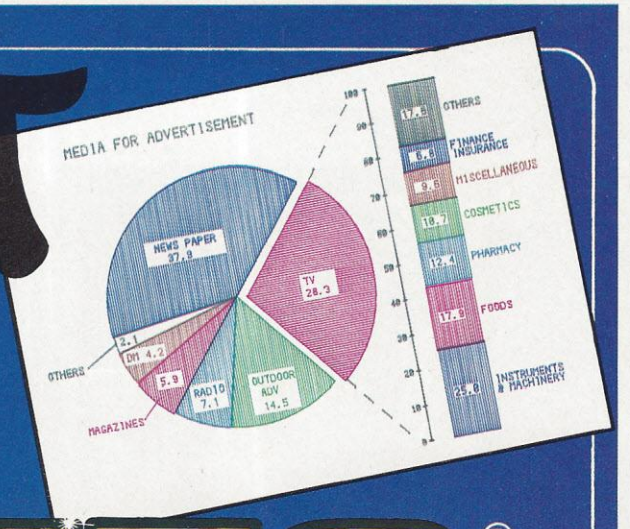

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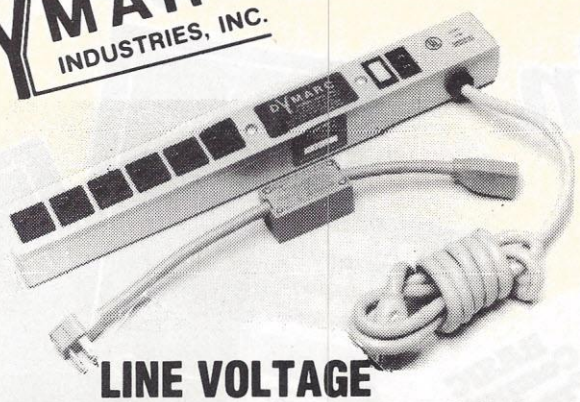

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(continued from page 248)

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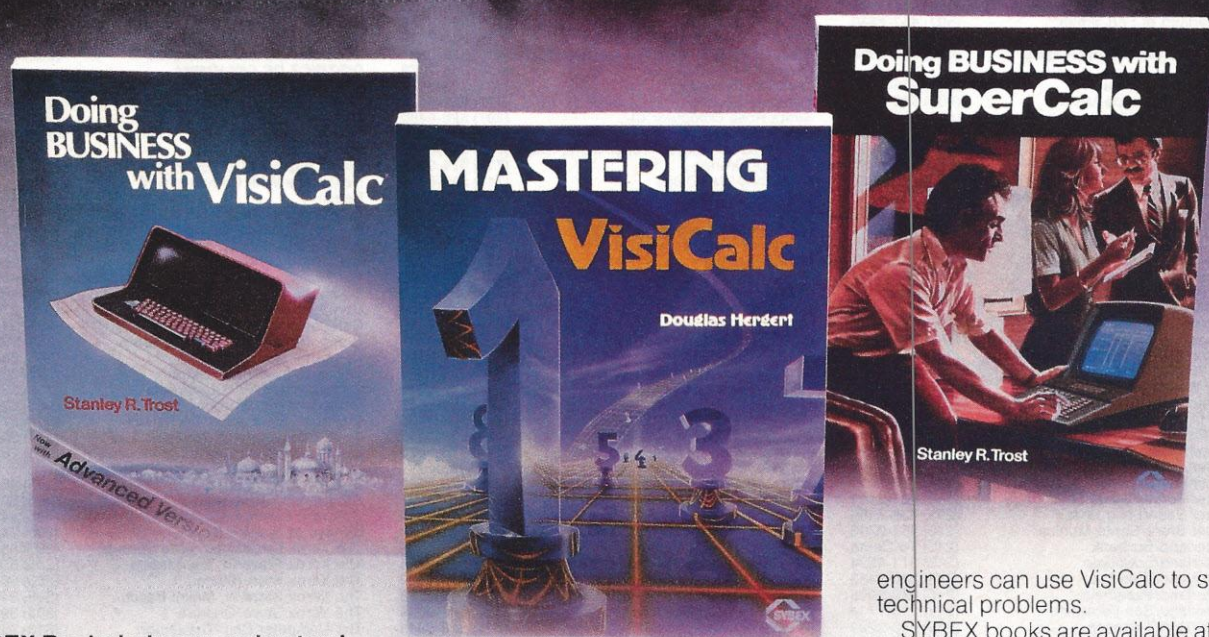

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Compushop/Rolling Meadows (312) 593-1800
The Computer Store/Oaklawn (312) 499-1300
Computerland (312) 949-1300
Computerland (312) 967-1714
Computerland/Naperville (312) 369-3511
Computerland/Niles (312) 967-1714
Computerland/Northbrook (312) 272-4703
Computerland/Oak Lawn (312) 422-8080
Computerland/Oak Park (312) 383-1606
Computerland/Schaumburg (312) 253-3009
Computerland of St. Charles (312) 377-7200
Data Domain/Schaumburg (312) 397-8700
Erickson Communication/Chicago (312) 631-5181
Future Computer Ltd./Forest Park (312) 771-5850
Illinois Microcomputer/Naperville (312) 420-8813
Kroch's & Brentano's/All stores (312) 332-7500
Micro Computer Ctr./Geneva (312) 232-1545
Nabih's Inc./Evanston (312) 869-6140
Northbrook Computers (312) 480-9190
Oak Brook Computer Ctr. (312) 941-9005
Page One/Roselle (312) 529-9060
Prairie News Agency/Chicago (312) 384-5350
The Software Store/Glenview (312) 998-4753
Sorbus Station/Bensonville (312) 459-8560
Wine Micro Computers (312) 420-8813
Univ. Bookstore/Carbondale (618) 536-3321
Alpine Computer Ctr./Rockford (815) 229-0200
Appletree Computer/DeKalb (815) 758-8666
Computerland/Rockford (815) 397-1666
Computer Store/Rockford (815) 962-7580
Computerland/Joliet (815) 741-3303
Ideal Computer Systems/Kankakee (815) 935-8505

INDIANA

Computer Plus (219) 865-3930
Computerland/Ft. Wayne (219) 483-8107
Computerland/Mirabel (219) 769-8020
Computerland/Mishawaka (219) 256-5688
Data Base/Ft. Wayne (219) 484-3164
A Computer Store/Indianapolis (317) 898-0331
Computer 1/Indianapolis (317) 257-3336
Computercraft/Carmel (317) 846-5996
Computerland/Anderson (317) 649-1122
Computerland/Indianapolis (317) 849-8811
Computerland/W. Lafayette (317) 463-3546
Graham Electrs./Indianapolis (317) 634-8202
The Software Exchange/Indianapolis (317) 251-7786
Von's Bookshop/W. Lafayette (317) 743-1915
Book Corner/Bloomington (812) 339-1522
Custom Software/Terre Haute (812) 234-3242
Data Domain/Bloomington (812) 334-3607
Hoosier Electrs./Terre Haute (812) 232-8508
KOE Computers./Div. Knapp/ Terre Haute (812) 232-4361

IOWA

Computer Country, Inc./Marion (319) 377-9437
Memory Bank/Bettendorf (319) 386-3330
Memory Bank/Clinton (319) 242-2755
The Partstore/ Marion (319) 373-1803
Computerland/Des Moines (515) 270-8400
Omni Computer Center/Des Moines (515) 276-8858

KANSAS

Amateur Radio Equip./Wichita (316) 264-9166
Computer Associates, Inc./Coffeyville (316) 251-1800
Computerland/Hutchinson (316) 662-6832
Computerland/Wichita (316) 684-3870
High Technology/Wichita (316) 262-0315
Book Shop/Manhatten (913) 537-8025
Commonwealth Computers, Inc./ Overland Park (913) 648-8086
Computerland (913) 492-8882
Computerland/Lawrence (913) 841-8611
Computerland/Topeka (913) 267-6530
Kansas Micro Computer/Lawrence (913) 841-6348
Online Computer Centers/Overland Pk. (913) 341-6651
Personal Computer Ctr./Overland Pk. (913) 649-5942
The Computer Room/Beatty (913) 341-3500

KENTUCKY

Computer Emporium/Louisville (502) 589-9482
Computerland of Bowling Green (502) 781-9990
Heathkit Electr./Louisville (502) 245-7811
Stereo Stable's Computer Stall/ Owensboro (502) 685-6016
Computer Place/Lexington (606) 276-3594
Computer World/Ashland (606) 329-0545
MicroAge Computer Store/Lexington (606) 278-0304

LOUISIANA

Computers For All Inc./New Iberia (318) 365-9507
Computer Shoppe Inc./Metairie (504) 454-6600
Computer Terminal/New Orleans (504) 891-0007

MAINE

Coastal Computer Center/Brunswick (207) 729-0298
Retail Computer Ctr./Elsworth (207) 669-6736

MARYLAND

Balance Corp. Center Inc./Baltimore (301) 625-1100
Bethesda Computers (301) 657-1982
Chafitz/Rockville (301) 340-3300
The Comm. Center/Laurel (301) 782-0600
Computer Strategies Inc./Gaithersburg (301) 840-2173
Computer Unlimited/Towson (301) 321-1553
Computers Etc./Annapolis (301) 268-5801
Computerland (301) 340-8484
Computerland/Towson (301) 337-5555
Fredericks Computer Products/Frederick (301) 684-8884
Heathkit Electrs. (301) 881-5420
Komar Ltd./Baltimore (301) 675-2200
Logical Choice/Ellicott City (301) 465-3175
Program Store/Baltimore (301) 944-0200
Radio Shack/Annapolis (301) 224-2900
Tri-State Computers/Salisbury (301) 742-2020
The Xerox Store/Rockville (301) 424-1450

MASSACHUSETTS

Computer Source/Pittsfield (413) 443-7181
Retail Computer Ctr./Ludlow (413) 589-0106
Computer City (617) 755-5464
Computer City (617) 875-8126
Computer City (617) 273-3146
Computer City (617) 242-3350
Computer City (617) 826-9217
Computer City (617) 774-7118
Computer Store/Sudbury (617) 232-5470
Computer Store/Cambridge (617) 354-4599
Computerland/Boston/Wellesley (617) 235-6652
Computerland/Boston (617) 482-6033
Computerland of Boston/Reading (617) 942-0707
Eden Microcomputers/Osterville (617) 428-3515
The Game Shop/Acton (617) 263-0418
Harvest Computer/Cambridge (617) 547-3289
Heathkit Electrs./Wellesley (617) 237-1510
Land of Electronics/Saugus (617) 581-3133
The Micro Store/Taunton (617) 823-8106
New England Electronics CO/Needham (617) 449-1765
Ni-Ni's Corner, Inc./Cambridge (617) 547-3558
Out of Town News/Cambridge (617) 354-7777
Palace Spa/Brighton (617) 783-5858
Retail Computer Ctr (617) 935-8060
Small Business Group/Westford (617) 692-3800
Video Station/Woburn (617) 933-1445
YDI Electrs./Needham (617) 449-1005
The Xerox Store/Boston (617) 451-5800
The Xerox Store/Burlington (617) 273-5665
The Xerox Store/Chestnut Hill (617) 566-1707

MICHIGAN

Allen Park Computer Center/Allen Park (313) 383-8254
Binary Corp/Berkley (313) 548-0533
Community News Center (313) 662-6150
Computer Center/W. Bloomfield (313) 422-2570
Computer Connection/Farmington Hills (313) 447-4470
Computer Contact, Inc./Grand Blanc (313) 694-3704
Computer Horizons (313) 464-6502
Computer Mart (313) 649-0910
Computer Mart/Flint (313) 234-0161
Computerland (313) 973-7075
Computerland/Southfield (313) 356-8111
Condor Business System Center/ Ann Arbor (313) 769-3988
The Family Computer Center/Berkley (313) 546-8114
Front Page Bookstore/Pontiac (313) 332-3431
Heathkit Electr./Detroit (313) 772-0416
Infosource/Southfield (313) 353-0660
Heathkit Electr. Ctr./Detroit (313) 535-6480
Maple Office Supplies/Southfield (313) 559-8811
Micro Station Inc./Southfield (313) 358-5820
New Horizons Book Shop/Roseville (313) 296-1560
Rainbow Computers/Troy (313) 528-3535
Rochester Book Center (313) 651-0199
Simtec/Birmingham (313) 855-3990
Spectrum Computers/Lathrup Village (313) 559-5252
Very Small Business Computers/Warren (313) 573-7260
Community Newscenter (517) 694-0490
Community Newscenter (517) 349-3510
Computer Mart/Lansing (517) 351-1777
Comtec/Owosso (517) 725-7326
Computer Mart/Kalamazoo (616) 329-1000
Computerland/Grand Rapids (616) 942-2931
Computers & More/Grand Rapids (616) 243-3525
Doc's Other Computer Store/Muskegon (616) 755-3906
Heath Computer Store/St. Joseph (616) 982-3215
Professional Computer System/ St. Joseph (616) 429-9616
Professional Data Corp./Marquette (906) 228-2626

MINNESOTA

Granada News/Duluth (218) 727-9122
Readmore Book & Card/Mankato (507) 345-5704
Bit by Bit Computer Resource Ctr./ St. Paul (612) 646-4833
Computer Depot/Bloomington (612) 375-2008
Computer Professionals/Burnsville (612) 435-8060
Computerland (612) 559-1984
Digital Den/St. Paul (612) 699-8442
Micro Age Computer Store/Minneapolis (612) 338-1777
Minnesota Book Center/Minneapolis (612) 373-5734
Personal Business Systems/Minneapolis (612) 929-4120
Readmore Bookstore/Minneapolis (612) 333-3628
Schinders's Hennepin News/Minneapolis (612) 333-6942
Shinder Book & News/St. Paul (612) 227-0899
The Software Centre/Bloomington (612) 881-4514
The Xerox Store/Edina (612) 929-4334
The Xerox Store/Minneapolis (612) 332-6866
The Xerox Store/St. Paul (612) 227-3366

MISSISSIPPI

The Book Store/Greenville (601) 332-2665
Computer World/Hattiesburg (601) 544-3135
Computerland/Jackson (601) 362-8755
Computerland/Washington County (601) 378-5861
Miss-Lou Computer Center/Natchez (601) 442-2836
Programs Unlimited/Jackson To come
Southeastern Aud. Vis./Starkville (601) 324-0797

MISSOURI

Computer Center/St. Louis (314) 444-3111
Computer Country-North (314) 921-5644
Computerland/St. Louis (314) 567-3291
Famous-Barr Computer Ctr./St. Louis (314) 241-5469
Gateway Electrs/St. Louis (314) 427-6116
Micro-Age Computer Ctr./St. Louis (314) 567-7644
Computer Mart/Springfield (417) 862-6500
House of Computers/Joplin (417) 782-0880
Commonwealth Computers, Inc./ Kansas City (816) 356-6502
Computer Core/Kirksville (816) 627-1255
Computerland (816) 436-3737
Computerland (816) 364-4498
Computerland/Independence (816) 461-6502
Midwest Computer Systems, Inc./ Carrollton (816) 542-0022
University Bookstore/NW MO. State U/ Maryville (816) 582-5151

MONTANA

Art's Electronics/Great Falls (406) 453-8543
Computerland/Billings (406) 259-0565
Computerland/Great Falls (406) 727-8700
Consolidated Services/Amissonla (406) 721-1811
Prairie Computers/Great Falls (406) 727-6992

NEBRASKA

Eakes Office Prod. Ctr./ Grand Island (308) 382-8026
Computerland/Omaha (402) 391-6716
Electronic Center/Lincoln (402) 476-7331

NEVADA

Computerland/Las Vegas (702) 369-2001
Home Computers/Las Vegas (702) 736-6363
PCS Computer Service/Las Vegas (702) 870-4138

NEW HAMPSHIRE

Bitznbytes/Concord (603) 224-8233
Computer City (603) 898-2390
Computer City (603) 668-9527
Computerland of Manchester (603) 668-2110
Computerland/Nashua (603) 889-5238
Computer Mart (603) 883-2386
Computer Town/Salem (603) 893-8812
Microcon Software Centers/Manchester (603) 668-4080
North Country Computer Center/ Plymouth (603) 536-4163
Strictly Software/Hudson (603) 883-5005

NEW JERSEY

Bytes & Pieces/Jamesburg To Come
Apple Coor/Basking Ridge (201) 766-3977
Computer Corner (201) 835-7080
Computer Dimensions/Westfield (201) 232-8300
Computerland (201) 845-9303
Computerland/Eatontown (201) 389-2333
Computerland/Morristown (201) 539-4077
Computer Mart of New Jersey/E. Hanover (201) 428-0200
Computer Mart of New Jersey/Green Brook (201) 752-6300
Computer Mart of New Jersey/Iselin (201) 283-0600
Computer Nook/Pine Brook (201) 575-9468
Computer Technicians/E. Brunswick (201) 238-2780
Computer Universe/Paramus (201) 262-0960
Earth Rise Micro Sys./Madison (201) 822-0518
Entre Computer Center/Paramus (201) 342-0080
Felice's Follies/Red Bank (201) 842-2862
Heathkit Electr. Ctr./Fairlawn (201) 791-6935
Lloyd's Computers/Ridgewood (201) 445-8801
Monmouth Computer Services/ Shrewsbury (201) 747-6745
Software City/Fairview (201) 943-9444
Software City/Teaneck (201) 692-8317
Software Network/Upper Montclair (201) 744-2952
Stonehenge Computer/Summit (201) 277-1020
The Computer Center, Inc./Montvale (201) 391-1006
Atlantic Computer Systems/Tom River (609) 240-3101
Bargain Brothers/Trenton (609) 883-2050
Computer Encounter/Princeton (609) 924-8757
Computer Mart of New Jersey/ Lawrenceville (609) 452-1858

PERSONAL COMPUTING DEALERS

The Computer Port/Northfield (609) 641-4300
Computer Workshop/Cherry Hill (609) 665-4404
Computerland/Cherry Hill (609) 795-5900
Computerland/Lawrenceville (609) 882-1400
Personal Computing (609) 927-3880
Radio Shack/Moorestown (609) 244-7494
Radio Shack/Toms River (609) 234-2666
Software City/Princeton (609) 683-1644
Sorbus Station (609) 662-0997

NEW MEXICO

Computer Shop/Clovis (505) 762-3327
Computerland/Santa Fe (505) 988-8800
Electronic Parts Co./Albuquerque (505) 293-6161
Micro Waves Computer Store/Albuquerque (505) 883-0955
Computer Tech Assoc./Las Cruces (915) 533-2108

NEW YORK

Computer Center/New York (212) 889-8130
Computer Discount Services/New York (212) 757-8698
The Computer Edge/Mt. Kisco (212) 664-3212
Computer Era/New York (212) 860-0500
Computerland (212) 840-3223
Computerland of Little Neck (212) 423-5280
Computerland of Wall Street/NY To Come
Comtek/Brooklyn (212) 962-6131
Comtek/Staten Island (212) 698-7050
Datel Sys./New York (212) 921-0110
Greenwich Village Computers/New York (212) 254-9191
Harcourt Brace Bookstore/New York (212) 888-3333
J&R Music World/New York (212) 732-8600
Leigh's Computer World/New York (212) 879-6257
Magazine Emporium/New York (212) 864-0500
Majority New Dist./New York (212) 243-7770
Papyrus Books/New York (212) 864-8862
Programs Unlimited of Smithaven To Come
Software City/Forest Hills (212) 261-1141
Super Business Machines/New York (212) 964-6666
Compu-Tech/Camillus (315) 471-7773
Computerland/Massina (315) 769-9971
Computers Etc./Syracuse (315) 446-6502
Radio World, Inc./Oriskany (315) 736-0184
Berliner Computer Ctr./New Hyde Pk. (516) 775-4700
Computer Headquarters (516) 698-8636
Computer Microsystems/Manhasset (516) 627-3640
Computer Shoppe/Patchogue (516) 758-6558
Computerland/Little Neck (516) 887-4747
Computerland/Nassau County (516) 742-2262
Data Scan Comp. Sys./Farmingville (516) 698-6285
Future Visions Computer/Melville (516) 423-7820
Harrison Radio/Farmingdale (516) 293-7990
Heathkit Electrs./Jericho (516) 334-8181
Programs Unlimited/Jericho (516) 997-8668
Spartan Electrs/Commack (516) 499-9500
Syosset Video & Electrs./Syosset (516) 921-5454
Castle Computers/Latham (518) 783-9405
Computer Room/Albany (518) 869-3818
Foothills Computer/Glens Falls (518) 792-0369
Future Distribution/Mogers (518) 561-5703
Lela Computer Suitors/Albany (518) 272-2691
Computer Tree/Endwell (607) 748-1223
Computerland/Ithaca (607) 277-4888
Computerland/Johnson City (607) 277-4888
Unicorn Electronics/Johnson City (607) 798-0260
Computer Resource/Williamsville (716) 633-9510
Computerland (716) 586-0378
Home Computer Ctr./Rochester (716) 244-6237
Micro Age Computer Store/Rochester (716) 244-9000
Modern Tek Shop, Inc./Snyder (716) 839-5800
Readout Computers/Buffalo (716) 634-9354
All Things Computer/Scarsdale (914) 723-6262
Computer Corner/White Plains (914) 949-3282
Computer Store/White Plains (914) 428-1661
Computerland of Rockland/New City (914) 638-4440
Heathkit/N. White Plains (914) 761-7690
Mr. Computer/Wappinger Falls (914) 297-1223
Mr. Oz News Center Book Store/New City (914) 638-0990
Programs Unlimited/White Plains (914) 761-9283
Software Etc./Central Nyack (914) 358-3004
Computerland of Wall Street To Come

NORTH CAROLINA

Byte Shop/Charlotte (704) 568-8100
Computer Alternatives/Asheville (704) 274-5404
Computer Alternatives/Hickory (704) 324-2040
Computeroom/Charlotte (704) 377-9821
Computer Alternatives/Wilmington (919) 799-5440
Computerland/Greenville (919) 355-6110
The ComputerWare Store/Jacksonville (919) 346-8499
K & S Newstand/Winston-Salem (919) 724-7537
Liberty News & Beverage/Durham (919) 493-1180
The Program Center/Greensboro (919) 454-4708
Worldwide News & Specialties/Cary (919) 467-7130

NORTH DAKOTA

Computer 1/Fargo (701) 282-9471
Computerland/Fargo (701) 237-3069
Computerland/Grand Forks (701) 746-0491

OHIO

All Media Material (216) 678-5499
American Bookstore/New Parma (216) 888-8210
Basic Computer Shop/Akron (216) 867-0808
The Basic Computer Store/Cleveland (216) 831-3882
The Basic Computer Store/Cleveland (216) 241-0030
Cleveland Computer Co. (216) 946-1722
Computer Warehouse/Euclid (216) 481-1600
Computer-Site/Strongsville (216) 572-7483
Computerland/Akron-Canton (216) 493-7786
Computerland/Warren (216) 544-4191
The Corner Store/Median (216) 722-2777
Cosmic Comics/Cleveland (216) 784-3449
Hudson Computer/Hudson (216) 653-9010
News Depot/Canton (216) 454-4444
The Newstand/Cuyahoga Falls (216) 235-9321
North Coast Computers/Bay Village (216) 835-4345
Abacus II/Toledo (419) 865-1009
CP & You/Toledo (419) 535-0130
Leo's Book & Wine Shop/Toledo (419) 255-5506
The Open Book/Findlay (419) 423-1283
Programs Unlimited/Mansfield Hgts. To Come
Electronic Connexion/Kettering (513) 294-0222
Future Now/Cincinnati (513) 791-4700
Micro Computer Ctr. (513) 435-9355
News - Readers (513) 879-4444
Micro Age Computer Store (614) 868-1550
Micro Center/Columbus (614) 486-5381
Computerland/Youngstown To Come

OKLAHOMA

Book Shack/Enid (405) 233-1588
Computer Service Unlimited/Norman (405) 329-2154
Computer Works/Stillwater (405) 624-5276
Computerland/Oklahoma (405) 755-5200
Employee's Assoc. Bookstore/Okla. City (405) 686-4295
High Technology Retail/Oklahoma City (405) 528-8008
Micro Age Computer/Oklahoma City (405) 728-1837
American Small Business Computers/Pryor (918) 825-4844
Computer Store/Tulsa (918) 224-5347
Computerland/Tulsa (918) 481-0332
MicroAge Computer Store/Tulsa To Come

OREGON

Byte Shop/Beaverton (503) 644-2686
Computer Solutions/Eugene (503) 689-9677
Computer Specialties/Salem (503) 399-0534
Computer Store/Corvallis (503) 754-0811
Computerland/Portland (503) 620-6170
Compuware/McMinnville (503) 472-2972
C 2 E (503) 245-9785
Fifth Avenue News/Portland (503) 222-7462
Hood River Computers/Hood River (503) 386-9311
Pegasus Computer Store/Portland (503) 256-4713
New Day Computing/Portland (503) 223-8033
Rich Cigar Store/Portland (503) 228-1700

PENNSYLVANIA

A B Computers/Montgomeryville (215) 822-7727
Bookarama/Allentown To come
Computer Forum/Frazer (215) 296-3474
Computerland/Dresler (215) 542-8835
Computerland/Lancaster (215) 436-0422
Computerland/Lehigh Valley (215) 776-0202
Computerland/Paoli (215) 296-0210
Computerland/Philadelphia (215) 568-9930
The Computer Source/W. Reading (215) 375-4231
Doc's Computer Supply Center/Ardmore (215) 642-6550
Drexel University Book Store (215) 895-2000
Heathkit Electr. Ctr./Frazer (215) 288-0180
Intelligent Electronics/Lionville (315) 524-1800
Main Line Computer Center/Wayne (215) 687-8500
Marketline Sys./Huntington Valley (215) 947-6670
Micro Computer Center/Media (215) 565-1380
Mighty Byte Computer Ctr./Horsham (215) 443-9020
Never Ltd., Personal Software/Malvern (215) 296-2726
Solutions Computer Store/Doylestown (215) 345-4411
Tree of Knowledge/Reading (215) 779-8131
Video Village Computer Center/Philadelphia (215) 969-5270
The Computer Center/Greensburg (412) 834-7636
Computer House/Pittsburgh (412) 921-1333
Computer Workshoppe/Monroeville (412) 823-6722
Pittsburgh Computer Store/Pittsburgh (412) 391-8050
Computer Store/State College (717) 272-0294
Computers Unlimited/York (717) 755-1045
One Step Computer Shoppe (717) 761-6754
Computerland/Harrisburg (814) 533-6892
Erie Computer Co./Erie (814) 454-7652

RHODE ISLAND

Computer City/Providence (401) 331-2187
Computer Power/Warwick (401) 738-4477
Computerland/Providence (401) 274-5100

SOUTH CAROLINA

Colsmo Comm/Rockhill (803) 366-7157
Computer Source/Carleston (803) 763-0201
Computerland/Anderson (803) 224-5428

SOUTH DAKOTA

Computerland/Rapid City (605) 348-5384
Computerland/Sioux Falls (605) 338-5263

TENNESSEE

Campus Computers/Nashville (615) 327-9123
Chattanooga Computer Ctr. (615) 892-7038
Computerland of Chattanooga (615) 892-0840
Computerland/Knoxville (615) 693-8225
Computerland of Nashville (615) 292-8088
Computer South, Inc./Chattanooga (615) 892-7659
Eastern Micro Computer/Knoxville (615) 594-8365
MicroAge Computer Store/Nashville (615) 327-9669
Rush Elects/Bristol (615) 764-0831
Computer Lab/Memphis (901) 761-4743
Computerland/Memphis (901) 767-0233
Tobacco Corner/Memphis (901) 682-3326

TEXAS

Compu Shop/Richardson (214) 783-1252
Computer Video Sys./Plano (214) 423-3654
Computerland/Longview (214) 663-3202
Computerland/Richardson (214) 363-2223
Computerland/Tyler (214) 581-7000
Simtec/Dallas (214) 484-3319
Software Access/Irving (214) 255-5615
Software Concepts/Dallas (214) 458-0330
Softwares/Dallas (214) 644-5043
Strictly Software/Dallas (214) 392-3030
Capital Micro/Austin (512) 472-7590
Computer 'N' Things/Austin (512) 453-5970
Computer Shop/San Antonio (512) 828-0553
Computer Solutions/San Antonio (512) 341-8851
Computer To-Go/Austin (512) 472-8926
Computerland (512) 724-1551
Computerland/Austin (512) 452-5701
Computerland of Austin II (512) 327-7044
Douglas Electronics/Corpus Christi (512) 883-5103
Expensive Toys/Big Boys/San Antonio (512) 340-5600
Heathkit/San Antonio (512) 341-8876
The Right Stuff/Austin (512) 346-1321
The Software Place/Austin (512) 453-0851
Micro Age Computer Store/Houston (602) 894-9247
City Electr. Supply/Houston (713) 621-1060
Computer Center/Houston (713) 527-8008
Computer Galleries/Houston (713) 956-0900
The Computer Store (713) 846-7766
Computercraft/Houston (713) 977-0664
Computerland/Houston Bay (713) 488-8153
Computerland/Westwood (713) 270-1200
Computerland of Brazos Valley (713) 846-2378
Computerland of Pasadena (713) 473-1200
D. Armstrong Co., Inc./Houston (713) 957-4818
Lone Star News/Houston (713) 981-0288
Micro Age Computer Store (713) 270-9647
Micro Age Computer Store (713) 440-7547
Northwest Newstand/Houston (713) 681-7310
Simtec/Houston To Come
Waghalter Books/Houston (713) 627-9970
Westheimer Newstand/Houston (713) 781-7793
The Xerox Store/Houston (713) 972-1791
The Xerox Store/Houston (713) 654-8913
The Xerox Store/Richardon To Come
Young Electrs./College Station (713) 693-8080
Agriplex Computers/Lubbock (806) 797-4495
Computerland/Waco (817) 776-6700
Computer Port/Arlington (817) 469-1502
Computer Pro/Ft. Worth (817) 654-3360
Heathkit (817) 737-8822
Waco Comm. (817) 772-8550
Computer Tech Assoc./El Paso (915) 533-2108
Computer West (915) 655-3391

UTAH

Computerland/Orem (801) 224-2608
Computerland/Salt Lake (801) 364-4416
Hi-Fi Shop/Datalines/Ogden (801) 621-5244
Quality Technology/Salt Lake City (801) 521-5040

VERMONT

Data Tronic/Brattleboro (802) 257-0555
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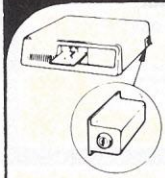

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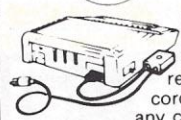

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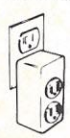

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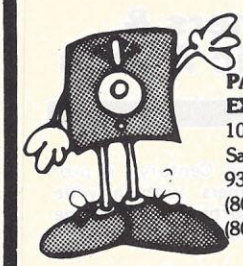

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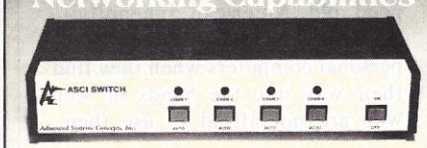

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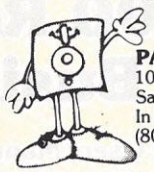

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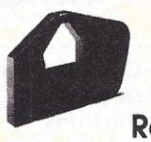

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44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
99	RRCONVBD	Investor's rate of return on convertable bond
100	PORTVAL9	Stock market portfolio storage-valuation program

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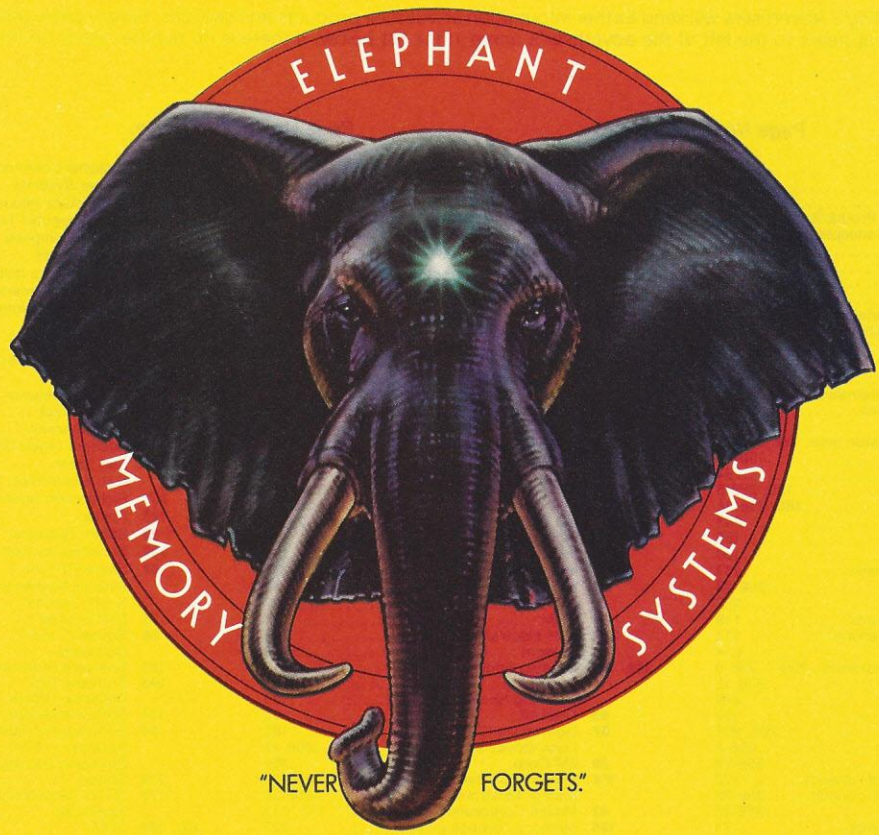

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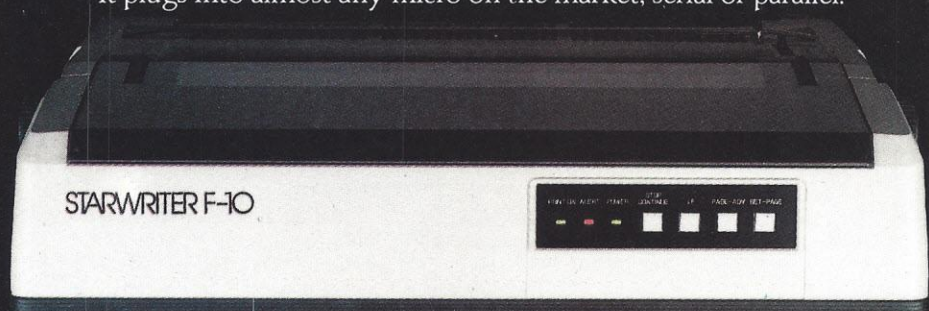
The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you denser, correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).
Prowriter: 120 cps. 80 columns dot matrix compressable to 136. 10" carriage. Parallel or serial interface.
Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode. Parallel or serial interface.

THE STAR.

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing. It plugs into almost any micro on the market, serial or parallel.



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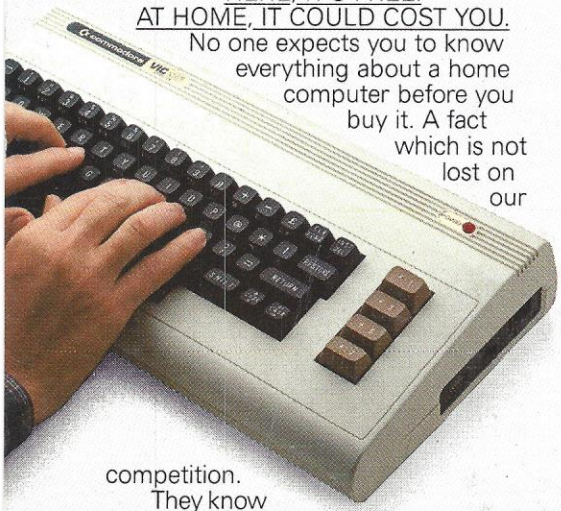
HOME IS THE LAST PLACE YOU SHOULD LEARN ABOUT A HOME COMPUTER.

WANT TO LEARN SOMETHING ABOUT HOME COMPUTERS? HERE, IT'S FREE. AT HOME, IT COULD COST YOU.

No one expects you to know everything about a home computer before you buy it. A fact which is not lost on our competition.



They know that an impressively low price can divert your attention from some depressingly cheap features. So that you won't know what you may be missing with their home computer until after it's been in your home for a while.

At which point, naturally, it'll cost you to change your mind.

IT'S EASY TO TELL THE DIFFERENCE.

Fortunately, you don't have to be a computer engineer to tell what makes the Commodore VIC 20™ superior to the competition. All you have to do is take advantage of three of your five senses.

Use your sense of vision and read this comparison chart. You can see in black and white where two of our major competitors have skimped. Use your sense of touch in the store. You'll feel the VIC 20's superiority immediately. It feels a lot more expensive than it is.

If these two senses don't convince you that the VIC 20 offers more for the money than any other home computer, simply rely on common sense.

NOW THAT YOU KNOW HOW EASY A COMMODORE HOME COMPUTER IS TO OWN, FIND OUT HOW EASY IT IS TO EXPAND.

One thing about home computers that you're bound to discover at home is that, once you learn what they can do, you'll want them to do more and more. To do this, you may need accessories called peripherals. These let you get more out of a home computer by letting you put more into it.

They include items like cassette recorders and disk drives to input data, modems for telecomputing and printers. And all VIC 20 peripherals are fully compatible with the powerful Commodore 64™ personal computer.

PLAN AHEAD.

When you start looking at your first home computer, you may think it's too early to start planning to add peripherals. If that's what you think, you're once again playing right into the hands of our competitors.

Because once they've gotten you to buy their home computer, for what seems to be a reasonable price, they have you hooked on their system.

The costs of which, if you'll examine the chart below, can really start getting unreasonable. For example, while these computers may seem to be close to the same price to start, an expanded system can cost you twice as much with TI or Atari as with the Commodore VIC 20 or Commodore 64.

EXPANSION COSTS	VIC 20™ or COMMODORE 64™	TI99/4A®	ATARI 400®
BASIC	Included	Included	$59.95
Peripheral Expansion System	Not Necessary	$249.95	Not Necessary
Disk Drive	$399.00	399.95	599.95
Disk Controller Card	Included	249.95	Included
Modem	109.95	224.95	199.95
Modem Interface	Included	174.95	219.95
TOTAL	**$508.95**	**$1299.75**	**$1079.80**

Manufacturer's suggested list prices: Prices per TI June-December 1982 U.S. Consumer Products Suggested Price List. Atari prices effective July 1, 1982 Suggested Retail Price List.

THINK OF IT AS BUYING A TOASTER.

It's easy to fill up a computer ad with RAM's and ROM's, numbers and technical jargon. But when it comes right down to it, buying a home computer is just like buying anything else. It's important to know just what you're getting for your hard-earned money.

And we hope we've accomplished that here by telling you about the cost of expanding your Commodore VIC 20 or Commodore 64 computer.

COMPUTER FEATURES	VIC 20	TI 99/4A	ATARI 400
Typewriter Keys	Yes	Yes	No
Typewriter Feel	Yes	No	No
Color Control Keys	Yes	No	No
Graphics on Keys	Yes	No	No
Reverse Letters	Yes	No	Yes
Programmable Function Keys	Yes	No	No
Works with TV or Monitor	Yes	Yes	No
True Lower Case Letters	Yes	No	Yes
DISK FEATURES			
Capacity	170K	90K	88K

commodore COMPUTER

CIRCLE 145

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